SECTION 5. MAINTENANCE

5.1 INTRODUCTION

This section of the manual gives procedures for changing fuses, using calibration modes 1, 2, 3 and 4, performing various periodic checks of the monitor operation, making certain adjustments, and using the alarm codes for trouble isolation.

Throughout this section various illustrations show an AC power switch on the back of the monitor. This AC power switch is ***only*** found on some international units. When using AC power or charging the battery, with these units, the AC power switch must be in the "I" position.

5.2 CHANGING FUSES

The monitor contains three fuses. Two AC line power fuses are contained in the power entry module. One battery fuse is contained on the power supply board and is accessible only after removing the rear case.

5.2.1 Replacement of Line Power Fuses

Remove the power cord (if one is attached) at the rear of the monitor. Using a flat bladed tool such as a screwdriver or key, pry up the lower edge of the door below the power connector as shown in Figure 5-1 and swing the door upward on its hinge to reveal the two fuse holders.

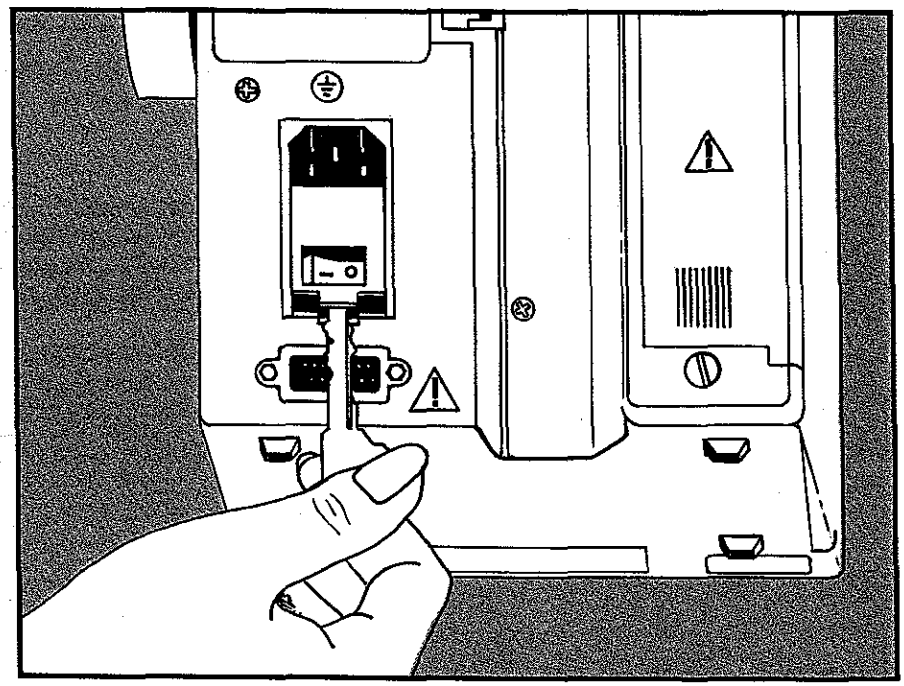


Figure 5-1. Open AC Line Fuse Compartment

5.2.1
Replacement of Line Power Fuses
Continued

Using the same tool, pry out each fuse holder as shown in Figure 5-2

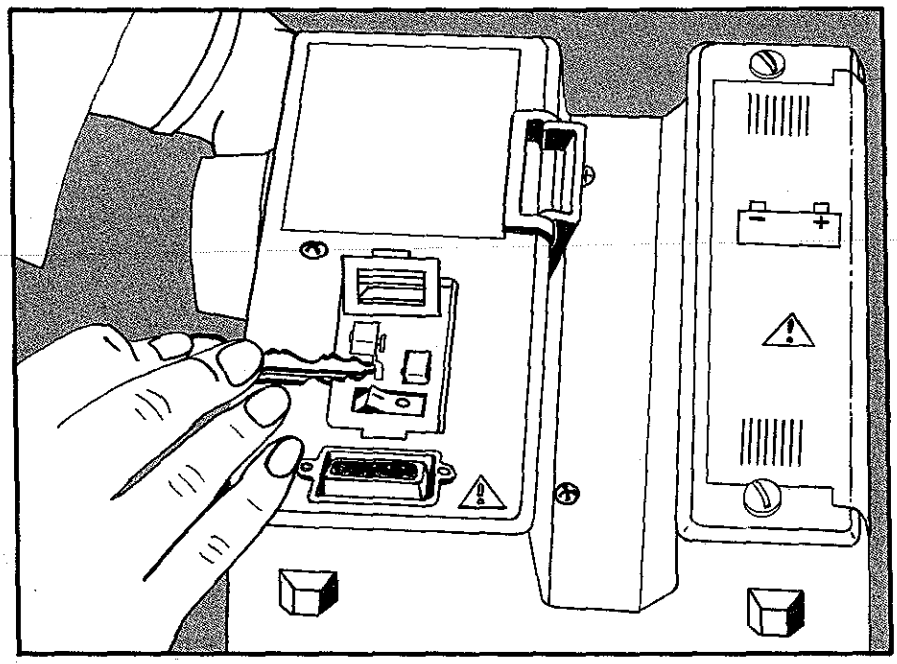


Figure 5-2. Remove Fuse Holder

Remove each fuse from its fuse holder as shown in Figure 5-3 and inspect it for a burned or broken filament. If the filament appears to be intact, check it for continuity with an ohmmeter. Replace the blown fuse with one of the specified rating and type.

Reinstall the fuse and fuse holder as shown in Figure 5-4. Make sure that the arrows on the outward facing ends of the fuseholders are pointing in the same direction as the arrows on the inside of the cover plate. Snap down the cover plate.

5.2.1
Replacement of Line Power Fuses
Continued

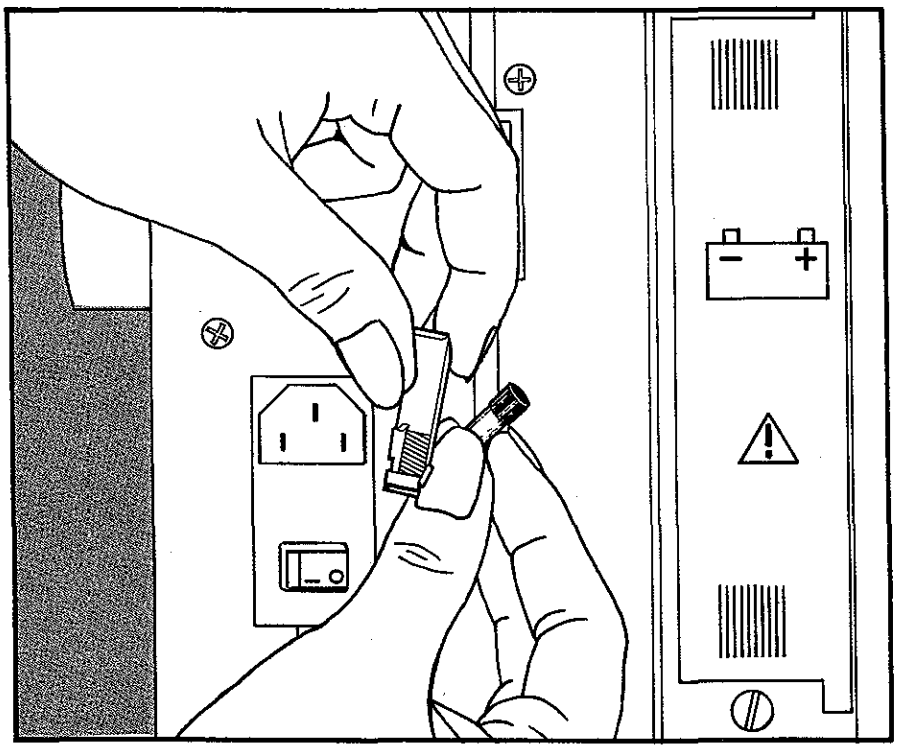


Figure 5-3. Remove Fuse From Fuse Holder

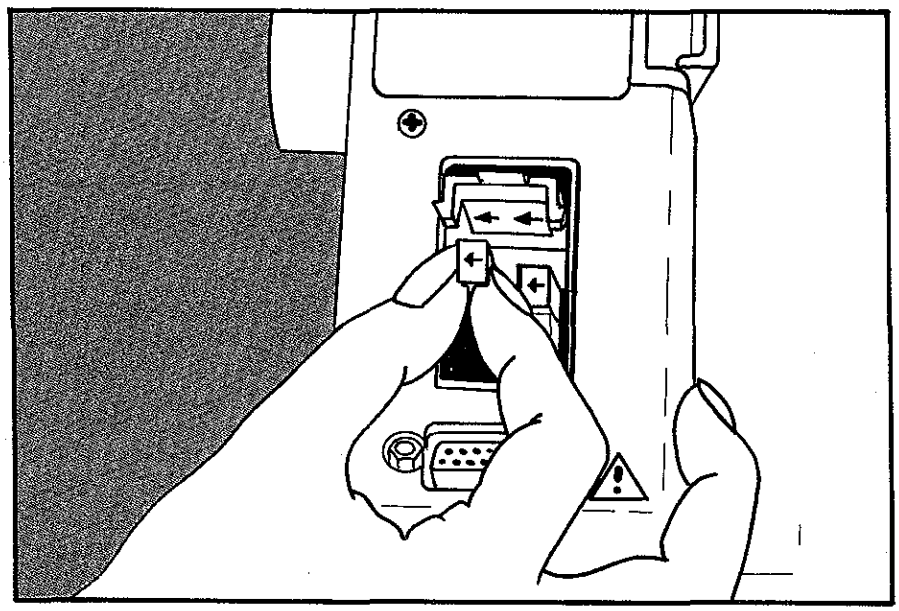


Figure 5-4. Reinstall AC Line Fuse and Fuse Holder

5.2.2 Replacement of Battery Fuse

Remove the power cord (if one is attached) at the rear of the monitor. Switch power off at the front panel. Using a Phillips screwdriver, remove the pole clamp knob screw and the five cover hold-down screws as shown in Figure 5-5.

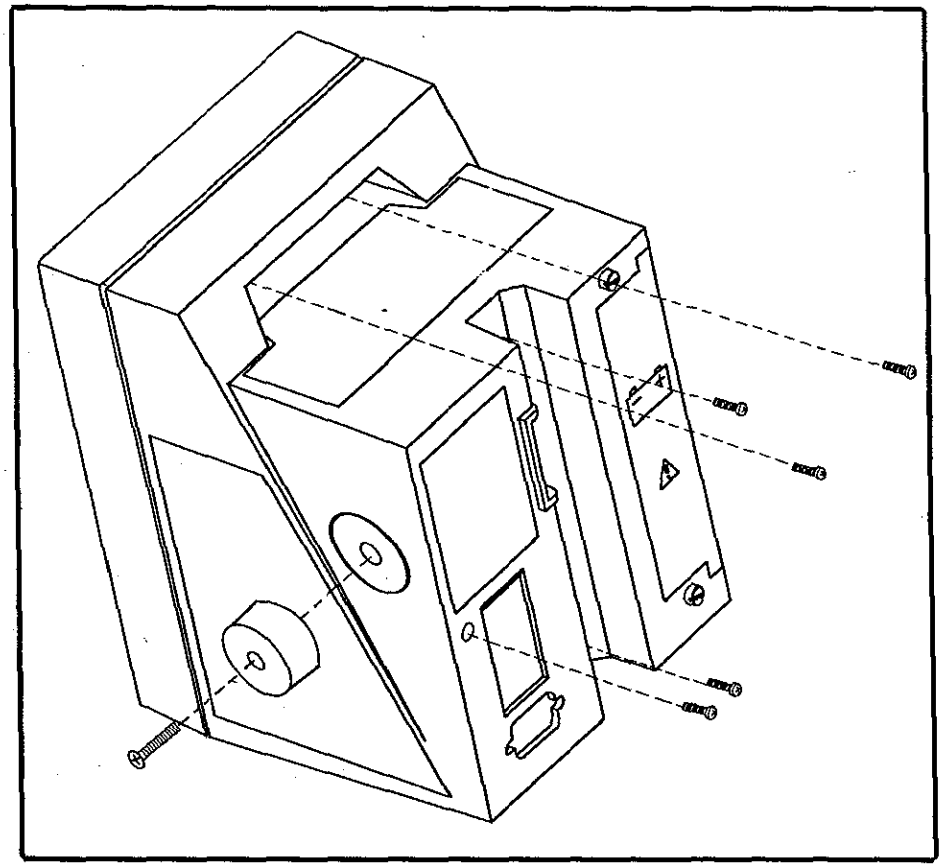


Figure 5-5. Remove Pole Clamp Knob and Case Cover

Remove the pole clamp knob and the rear cover. Disconnect the battery cable spade lug as shown in Section 3, Figure 3-9. Locate the battery fuse as shown in Figure 5-6 and remove it with an insulated fuse puller, or equivalent. Inspect the fuse for a burned or broken filament. If the filament appears to be intact, check it for continuity with an ohmmeter. Replace the blown fuse with one of the specified rating and type.

5.2.2 Replacement of Battery Fuse Continued

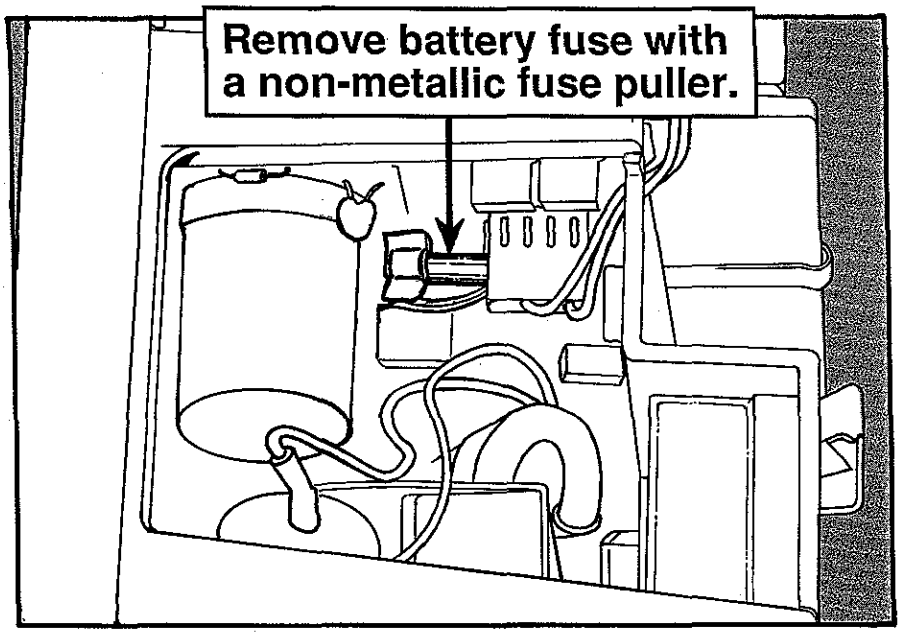


Figure 5-6. Remove The Battery Fuse

5.3 USING CALIBRATION MODES OF OPERATION

Five calibration modes of operation are provided for viewing certain internal operating parameters on the front panel displays and for exercising the digital displays. To enter the calibration mode, turn the monitor **OFF**, press and hold the **SET** switch for 4 seconds after turning power **ON**. The monitor will enter calibration mode 1. While in calibration, the mode is incremented each time the **SET** switch is pressed, wrapping around from calibration mode 5 to calibration mode 1 and so on. The monitor automatically switches out of calibration mode and into **MANUAL** mode at the end of three minutes. You may stay in calibration mode indefinitely, or until you press **CANCEL**, by holding the **SET** switch when turning power **ON** until a short beep is sounded (about 20 seconds).

5.3.1 Calibration Mode 1

When calibration mode 1 is entered, the monitor performs an auto-zero and then displays the following information in the four, main digital displays (a flashing 88 is shown in the **B.P. CYCLE MINUTES** window):

TEMPERATURE Display. The **TEMPERATURE** display will show pressure in mmHg applied to the **CUFF** ⚠ port. If this port is open to atmosphere, the display should be 0, +1/-0.

5.3.1
Calibration Mode 1
Continued

PULSE Display. The **PULSE** display will show a numeric code representing the alphabetical revision level of the software installed in the monitor EPROM. These numeric codes are defined in Table 5-1.

SYSTOLIC Display. The **SYSTOLIC** display will show the battery bus voltage (Vb) in volts (no decimal point). The display may be anything from 104 (10.4 Vdc) to 140 (14.0 Vdc) depending on the charge of the battery and whether or not the battery charger (**MAINS AC**) is on. Voltages under 11.5 Vdc will be flashed along with the **BATTERY** indicator (indicating low battery).

DIASTOLIC Display. The **DIASTOLIC** display will show the transducer excitation voltage (TP18 on the CPU board). Normal readings should be between 81 (0.81 Vdc) and 99 (0.99 Vdc). Readings outside this range will cause the display to flash.

Typical normal displays are shown in Figure 5-7.

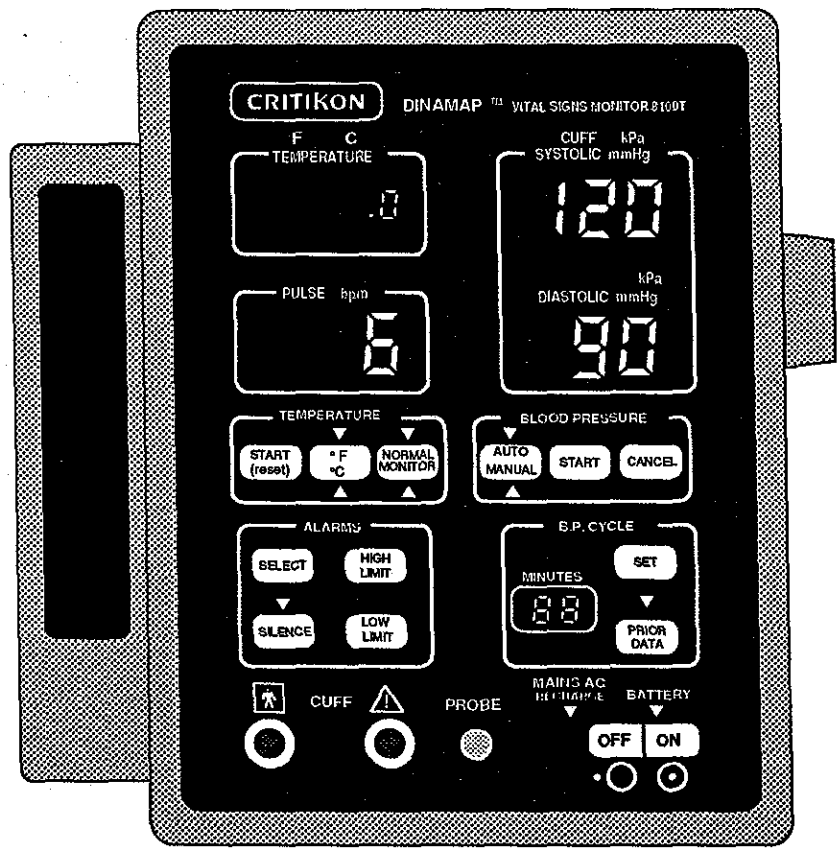


Figure 5-7. Typical Calibration Mode 1 Displays

5.3.1
Calibration Mode 1
Continued

TABLE 5-1. SOFTWARE REVISION LEVEL NUMERIC CODES

MINOR REVISION LETTER
(typically indicates an enhancement or bug fix since the previous revision)

MAJOR REVISION LETTER
(Indicates significant redesign and/or hardware incompatibility with other versions)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
A	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
B	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
C	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77
D	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103
E	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129
F	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155
G	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181
H	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207
I	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233
J	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259
K	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285
L	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311
M	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337
N	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363
O	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389
P	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415
Q	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441
R	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467
S	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493
T	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519
U	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545
V	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571
W	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597
X	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623
Y	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649
Z	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675

5.3.2
Calibration Mode 2

When calibration mode 2 is entered, the monitor performs an auto-zero and then displays the following information in the four, main digital displays (a flashing 88 is shown in the **B.P. CYCLE MINUTES** window):

TEMPERATURE Display. The **TEMPERATURE** display will show pressure in mmHg applied to the **CUFF** ⚠ port. If this port is open to atmosphere, the display should be 0, +1/-0.

PULSE Display. The **PULSE** display will show the zero offset applied by the microprocessor during the auto-zero. This value may be in the range of -50 (mmHg) to -1 (mmHg) depending on the environmental temperature and the particular drift characteristics of the transducer and amplifier circuit. At room temperature, this should be in the range of -18 to -32 (typically this is -25).

5.3.2
Calibration Mode 2
Continued

SYSTOLIC Display. The **SYSTOLIC** display will show the filtered pressure transducer (FPT) dc offset in A-to-D units. Typically, this value will be 10, ±1. If this value is out of range, it is an indication that the FPT amplifier circuitry is faulty.

DIASTOLIC Display. The **DIASTOLIC** display will show the output of the pressure channel when the 50 mmHg offset (DASH50-1 signal) is applied. This should be in the range of 49 to 53 (typically 51). This offset is checked every time an auto-zero is performed. Out of range the microprocessor generates a 924 hardware alarm.

Typical normal displays are shown in Figure 5-8.

Figure 5-8. Typical Calibration Mode 2 Displays

5.3.3 Calibration Mode 3

When calibration mode 3 is entered, the monitor displays the following information in the four, main digital displays (a flashing 88 is shown in the **B.P. CYCLE MINUTES** window):

TEMPERATURE Display. The **TEMPERATURE** display will show the measured +5 Vdc supply. The normal range of the display will be 46 (+4.6 Vdc) to 54 (+5.4 Vdc). Values outside this range will cause the display to flash and will cause the microprocessor, during normal operation, to generate the 911 hardware alarm.

PULSE Display. The **PULSE** display will show the measured -6 Vdc supply. The normal range of the display will be -50 (-5.0 Vdc) to -80 (-8.0 Vdc). Values outside this range will cause the display to flash and will cause the microprocessor, during normal operation, to generate the 913 hardware alarm.

Figure 5-9. Typical Calibration Mode 3 Displays

5.3.3 Calibration Mode 3 Continued

SYSTOLIC Display. The SYSTOLIC display will show the measured +8 Vdc supply. The normal range of the display will be 72 (+7.2 Vdc) to 88 (+8.8 Vdc). Values outside this range will cause the display to flash and will cause the microprocessor, during normal operation, to generate the 912 hardware alarm.

DIASTOLIC Display. The DIASTOLIC display will show the battery charging voltage (Vbc). The normal range of the display will be 0 (0 Vdc) to 320 (+32.0 Vdc) depending on the state of charge of the battery and the AC line voltage and whether or not the AC power is applied to the monitor.

5.3.4 Calibration Mode 4

Calibration mode 4 is provided mainly as a means of exercising the front panel LED's. When entered, calibration mode 4 performs the following sequence:

SEQUENCE	ACTION
1	Displays zeroes in all the digital displays.
2	Displays ones in all the digital displays.
3	Displays twos in all the digital displays.
4	Displays threes in all the digital displays.
5	Displays fours in all the digital displays.
6	Displays fives in all the digital displays.
7	Displays sixes in all the digital displays.
8	Displays sevens in all the digital displays.
9	Displays eights in all the digital displays.
10	Displays nines in all the digital displays.
11	Displays a "walking eight" in all the digital displays.
12	Sequentially turns on and off each point LED and then repeats the sequence starting with 1.

5.3.5 Calibration Mode 5

When calibration mode 5 is entered the monitor displays the following temperature channel information in the four main digital displays (a flashing 88 is shown in the **B.P. CYCLE MINUTES** window):

TEMPERATURE Display. The **TEMPERATURE** display will show the number of transitions (during a 1.5 second gate) of the VFC output for the selected temperature channel. Upon first entry, the displayed count is for the temperature probe input (channel 3). With nothing connected to the front panel **PROBE** connector, this should read 0. With the calibration plug connected, it should read 956 nominal. Any of the four input channels to the VFC may be selected for display by pressing the **HIGH LIMIT** or **LOW LIMIT** switches.

5.3.5 Calibration Mode 5 Continued

The contents of the **TEMPERATURE** display may be changed by pressing the **HIGH LIMIT** or **LOW LIMIT** switch.

Each press of the **HIGH LIMIT** switch will sequentially display :

1. Channel 0 (low calibration point) - Displays 57, nominal.
2. Channel 1 (high calibration point) - Displays 948, nominal.
3. Channel 2 (high reference point) - Displays 1154, nominal.
4. Channel 3 (probe input).
5. Returns to original display.

Each press of the **LOW LIMIT** switch will sequentially display :

1. Channel 2 (high reference point) - Displays 1154, nominal.
2. Channel 1 (high calibration point) - Displays 948, nominal.
3. Channel 0 (low calibration point) - Displays 57, nominal.
4. Channel 3 (probe input).
5. Returns to original display.

PULSE Display. The **PULSE** display shows the offset (in number of VFC transitions) for input channel 2 to the VFC. With no probe connected or an oral (blue) probe connected the offset is nominally 0. With the rectal probe (red) connected the offset is nominally -30.

SYSTOLIC Display. The **SYSTOLIC** display shows the offset (in number of VFC transistions) for input channel 0 to the VFC. This is nominally 0.

DIASTOLIC Display. The **DIASTOLIC** display shows the offset (in number of VFC transitions) for the input channel 1 to the VFC. This is nominally 0.

5.4 PERIODIC MAINTENANCE

Periodic maintenance tasks include cleaning the monitor, checking pressure calibration, checking for pneumatic leaks, checking the overpressure cutout switch, and checking the temperature calibration.

5.4.1 Cleaning the Monitor

The exterior of the monitor may be wiped clean with a cloth slightly dampened with mild detergents or normal hospital bacteriocides.

- ❒ Do ***not*** immerse unit.
- ❒ Do ***not*** clean with isopropyl alcohol or other solvents.

5.4.1
Cleaning the Monitor
Continued

- ❒ The Adult Cuffs supplied for use with this Monitor may be cleaned by hand washing in warm soapy water. Care should be exercised, however, to ensure that no water enters the cuff or cuff hoses at any time. Should water accidentally enter the cuff it may be dried by passing air through the cuff.
- ❒ The Neonatal Cuffs are supplied for single use and should be discarded if they become soiled.
- ❒ Do ***not*** immerse hoses.
- ❒ Do ***not*** immerse cuffs without prior application of cuff hose caps. (See caution statement under Calibration).
- ❒ The probe holder and temperature calibration plug may be removed (See figures 6-11 and 6-12) and cleaned with a mild detergent. The probe holder may be immersed during cleaning.
- ❒ Do ***not*** immerse temperature calibration plug.
- ❒ The probe may be cleaned with an alcohol solution. Use a cloth or sponge, just damp, ***not*** wet, and avoid getting any liquid into the interior of the probe.

5.4.2
Performing a Blood Pressure Calibration Check

Pressure calibration of the monitor should be checked at least once every three months or when there is doubt about the validity of the pressure readings. To perform a calibration check, follow these procedural steps:

CAUTION
Calibration equipment should always be kept dry and free of particulate matter. Moisture or foreign substances introduced into the pneumatic system can cause damage to the unit.

1. Obtain the calibration kit (Reorder No. 8886) supplied with the unit.
2. Connect a mercury manometer (Baumanometer 300, or equivalent) to the monitor using the parts supplied with the calibration kit as shown in Figure 5-10. In calibration procedure, use Adult Cuff and Air Hose.
3. Plug the monitor into the specified line power outlet.
4. Clamp off the mercury manometer. Fold the Adult Cuff in such a way that the index line is aligned with the inner range mark on the inside of the cuff.

5.4.2 Performing a Blood Pressure Calibration Check Continued

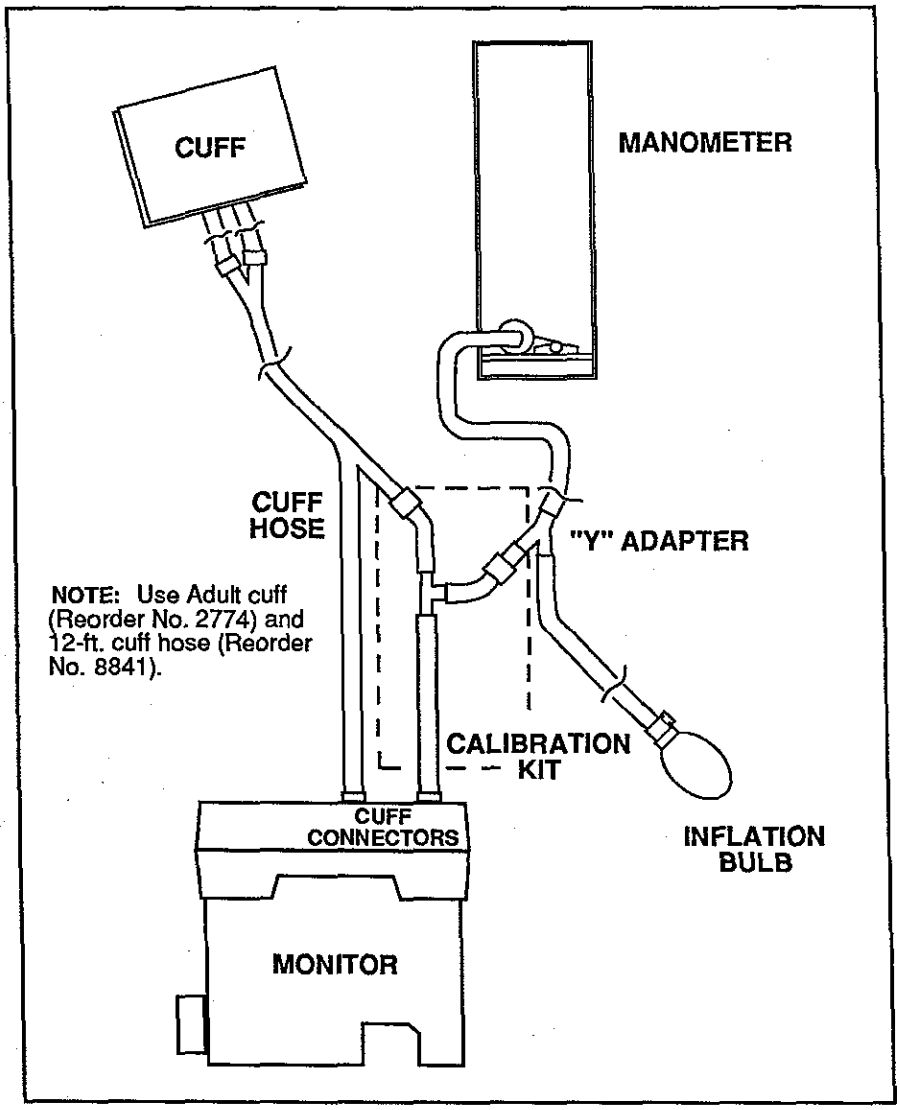


Figure 5-10. Pressure Calibration Check Setup

5. Press Front Panel **OFF** switch then press and hold the **SET** switch in for 4 seconds while pressing the Front Panel ON switch. Flashing 88s in the **CYCLE MINUTES** display indicate that calibration mode has been entered. The monitor will exit calibration mode if the **CANCEL** switch is pressed or after 3 minutes of inactivity. To remain in calibration mode indefinitely, hold the **SET** key for 20 seconds. The monitor will sound a short audio tone and remain in calibration mode until **CANCEL** is pressed. Cuff pressure will be displayed in the **TEMPERATURE** display. Allow the monitor to stabilize for about 30 seconds, then press **SET** five (5) times to perform an auto-zero operation.

5.4.2 Performing a Blood Pressure Calibration Check Continued

6. Using the inflation bulb, manually pump up the pressure to 200 mmHg, ± 2 mmHg, as indicated on the **TEMPERATURE** display and close pneumatic release valve on manometer bulb.

7. Verify that the pressure indicated in the **TEMPERATURE** display does not change more than 5 mmHg in 60 seconds.

NOTE

If the leakdown is greater than 5 mmHg in 60 seconds, isolate the source of the leak to either the cuff and hose or the monitor using cuff and hose leak test procedure which follows.

8. Release clamp from manometer tubing.

9. Verify that the **TEMPERATURE** display (Pressure Reading) indicates the correct pressure, as shown in Table 5-2, Calibration Check Pressure Levels.

TABLE 5-2 CALIBRATION CHECK PRESSURE LEVELS

MANOMETER PRESSURE	TEMPERATURE DISPLAY
200 mmHg, ± 1 mmHg	200 mmHg, ± 5 mmHg
150 mmHg, ± 1 mmHg	150 mmHg, ± 4 mmHg
100 mmHg, ± 1 mmHg	100 mmHg, ± 4 mmHg
50 mmHg, ± 1 mmHg	50 mmHg, ± 4 mmHg
0 mmHg	0 mmHg, + 1 mmHg, – 0 mmHg

10. If the indicated pressures are not within tolerance, the monitor must be calibrated. Refer to qualified service personnel.

5.4.3 Performing a Cuff and Hose Pneumatic Leak Check

1. Obtain the calibration kit (Reorder No. 8886) supplied with the unit.

2. Connect a mercury manometer (Baumanometer 300, or equivalent) with the parts supplied in the blood pressure calibration kit as shown in Figure 5-11.

3. Close the pressure release valve on the manometer inflation bulb and slowly pump up the pressure to 200 mmHg ± 2 mmHg, as indicated by the manometer.

5.4.3
Performing a Cuff and Hose Pneumatic Leak Check
Continued

4. Verify that the manometer pressure does not fall by more than 5 mmHg in 60 seconds. If it does, either the cuff or hose or both are defective. If the cuff and hose pass this test reconnect as shown in Figure 6-9. Pump up the cuff and hose to 200 mmHg, ± 2 mmHg, and perform the same leak check to determine if the leak is, in fact in the monitor. Perform this leak check for all cuff and hose combinations used with the monitor.

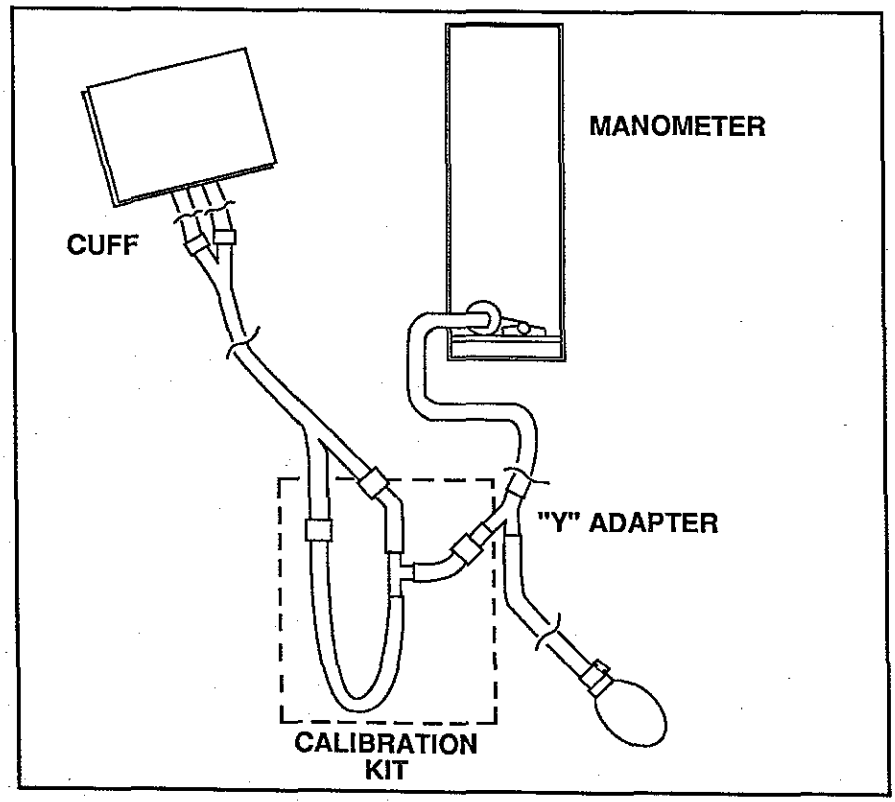


Figure 5-11. Cuff and Hose Leak Check Setup

5.4.4 Performing an Overpressure Safety Check

1. Obtain the calibration kit (part number 320-246) supplied with the unit.
2. Connect a mercury manometer (Baumanometer 300, or equivalent) to the monitor using an adult cuff (reorder number 2774) and the 12 ft. hose (reorder number 8841) with the parts supplied with the calibration kit as shown in Figure 5-10.
3. Place the monitor in calibration mode 1.
4. Close the valve on the manometer inflation bulb and slowly inflate the cuff. Verify that somewhere in the pressure range of 265 through 355 mmHg, the monitor deflates the cuff and generates a flashing 800 alarm in the **PULSE** display. If the overpressure cutout does not occur within this range, perform the overpressure switch adjustment procedure in paragraph 5.5.5.

5.4.5 Performing a Temperature Calibration Check

Temperature calibration of the monitor should be checked at least once a month or when there is doubt about the validity of the temperature readings. A calibration plug (Critikon Part No. 320-438) is supplied as an accessory to the Model 8100T DINAMAP™ Vital Signs Monitor. This plug is contained by a small clip inside the temperature probe holder on the left side of the monitor as shown in Figure 5-12. This plug may be used to check the calibration of the temperature detection circuits within the monitor.

To check the calibration, insert the plug into the temperature **PROBE** connector on the front of the monitor as shown in Figure 5-13 and press **POWER ON**. Place the monitor in **MONITOR** mode by pressing the **NORMAL/MONITOR** switch. The **TEMPERATURE** display should show **98.6**°F, ± 0.1, or **37.0**°C, ± 0.1.

CAUTION

DO NOT twist the Calibration Plug when inserting or removing it since this may damage the precision resistors contained within the plug.

If the display is off by more than ± 0.1 degree, the monitor is out of calibration and should be serviced by qualified service personnel. Qualified service personnel should refer to Paragraph 5.5.6 for calibration procedures.

5.4.5 Performing a Temperature Calibration Check Continued

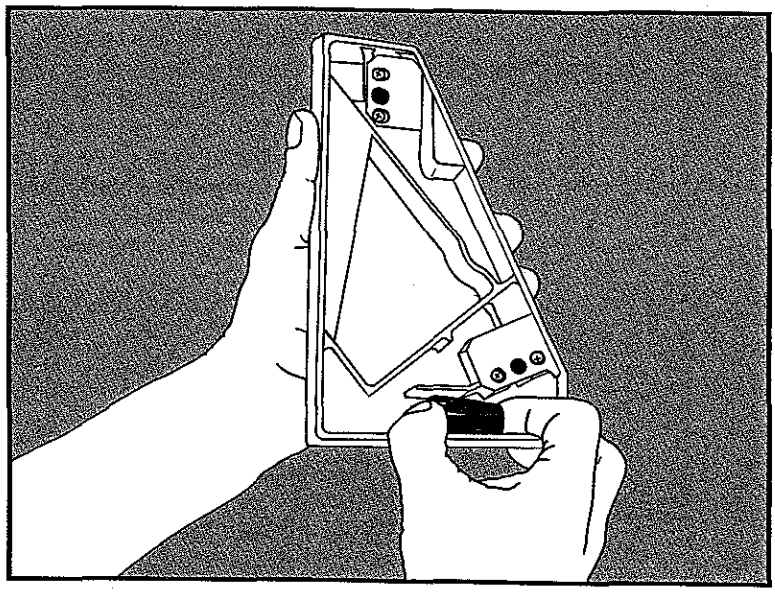


Figure 5-12. Locate Calibration Plug

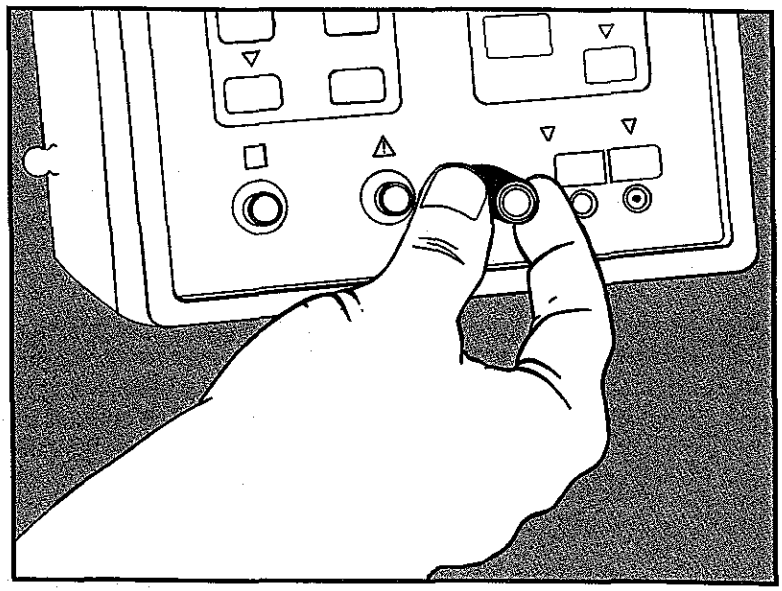


Figure 5-13. Connect Calibration Plug

5.5 ALIGNMENT AND ADJUSTMENTS

Before attempting any alignment or adjustment procedures, the equipment listed in Table 5-3 must be made available for use. Most test points and adjustments can be accessed by removing only the rear case. However, some of the first manufactured units may require that the frame assembly housing the power supply and pneumatics board be removed and electrically connected to the CPU board via the optional extender cables listed in Table 5-3. In all cases, these extender cables provide for easier test point access and troubleshooting to the component level.

TABLE 5-3. ALIGNMENT AND ADJUSTMENT EQUIPMENT LIST

EQUIPMENT	MANUFACTURER	MODEL
Digital Voltmeter	Fluke	8020 (or equiv.)
Caliration Kit	Critikon, Inc.	320-246
Digital Manometer*	Druck	DPI203 (or equiv.)
0.050" Hexagonal Wrench	Allen	0.050"
Phillips Screwdriver	–	–
65 ohm, 5 watt resistor	–	–
10 ohm, 5 watt resistor	–	–
9" Tuning Wand	GC Electronics	388SO020
Extender Cables (set of 4)**	Critikon, Inc.	300-607
Set includes:		
Power Supply Ext. Cable**	Critikon, Inc.	300-579
Keyboard Ext. Cable**	Critikon, Inc.	300-580
Display Board Ext. Cable**	Critikon, Inc.	300-581
Pneu. Board Ext. Cable**	Critikon, Inc.	300-583
Critikon Repair Kit***	Critikon, Inc.	300-613

* Manometer must have a range 0 - 400 mmHg or greater.
** These are optional and may be obtained through the Field Service parts department to facilitate CPU board adjustments and troubleshooting.
*** Kit includes common replacement parts. Contact Field Service parts department for more details.

5.5.1 Five Volt Logic Supply Adjustment

The +5 Vdc logic supply is adjusted by R13 on the top edge of the power supply board as shown in Figure 5-14. The voltage supply may be monitored at many locations on the boards or the extender cables but perhaps the easiest location for the voltmeter to be connected is the jumper locations at the bottom of the CPU board as shown in Figure 5-21.

Perform the following procedure:

1. Connect the positive lead of the voltmeter to the outside connector of JP12.

2. Connect the negative lead of the voltmeter to the outside connector of JP19.

5.5.1
Five Volt
Logic Supply Adjustment
Continued

3. Ensure that a charged battery is installed in the monitor or that the AC power supply is connected and the switch on the rear of the monitor is turned on (1 position).

4. Press the **ON** switch on the front of the monitor.

5. The voltmeter should read +5.05 Vdc, ±0.05 Vdc. Adjust R13 on the power supply board to obtain this reading.

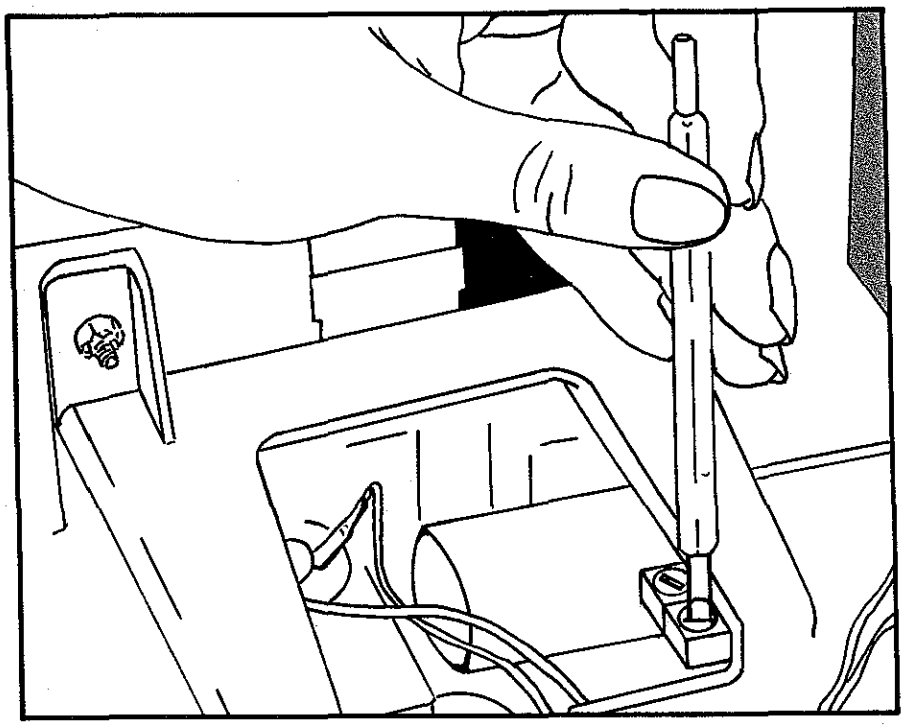


Figure 5-14. +5 Volt Logic Supply Adjustment

5.5.2
Battery Charger
Float Voltage Adjustment

The battery charger float voltage is adjusted by R12 on the power supply board as shown in Figure 5-15.

Perform the following procedure:

1. Disconnect the battery and connect the voltmeter to the battery connector leads from the monitor. Positive voltmeter lead to the red battery lead; negative voltmeter lead to the black battery lead.

2. Ensure that the AC power supply is connected to an appropriate outlet and the switch on the rear of the monitor is turned on (1 position).

5.5.2
Battery Charger
Float Voltage Adjustment
Continued

3. The voltmeter should read +13.75 Vdc, ±0.05 Vdc. Adjust R12 on the power supply board if need be to obtain this reading.

4. Check the full load regulation of the battery charger by connecting the 65 ohm, 5 watt resistor across the battery terminals and measure the voltage across the resistor. This should be a minimum of +13.50 Vdc.

5. Check the current limiting function of the battery charger circuit by connecting the 10 ohm, 5 watt resistor across the battery connector leads and measure the voltage across the resistor. This should be less than +3.5 Vdc.

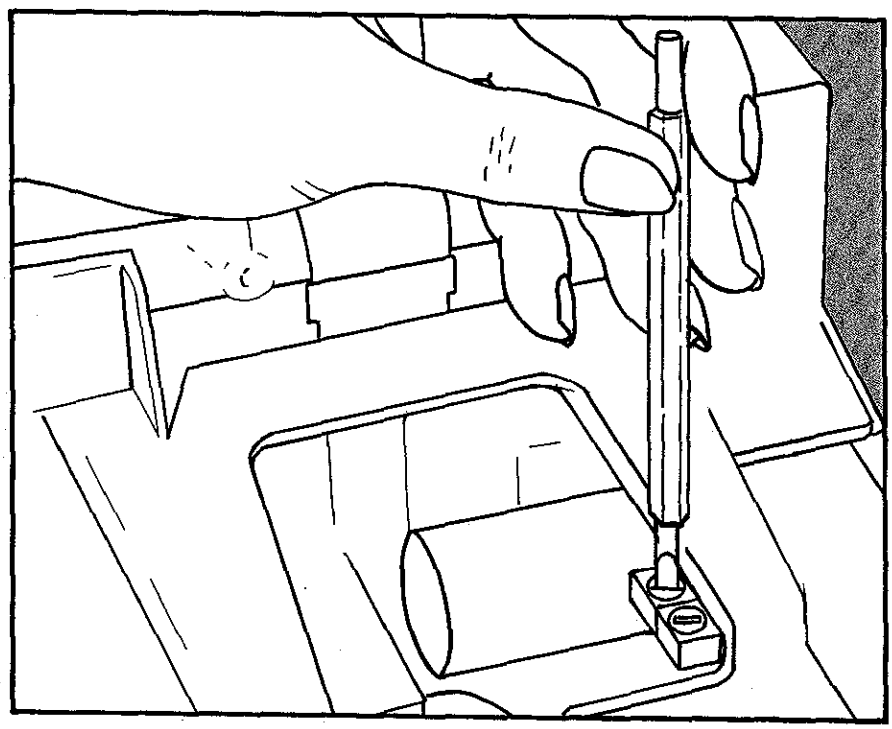


Figure 5-15. Battery Charger Float Voltage Adjustment

5.5.3 Precision Reference Voltage Adjustment

The precision reference voltage supply is adjusted by R48 on the CPU board as shown in Figure 5-16.

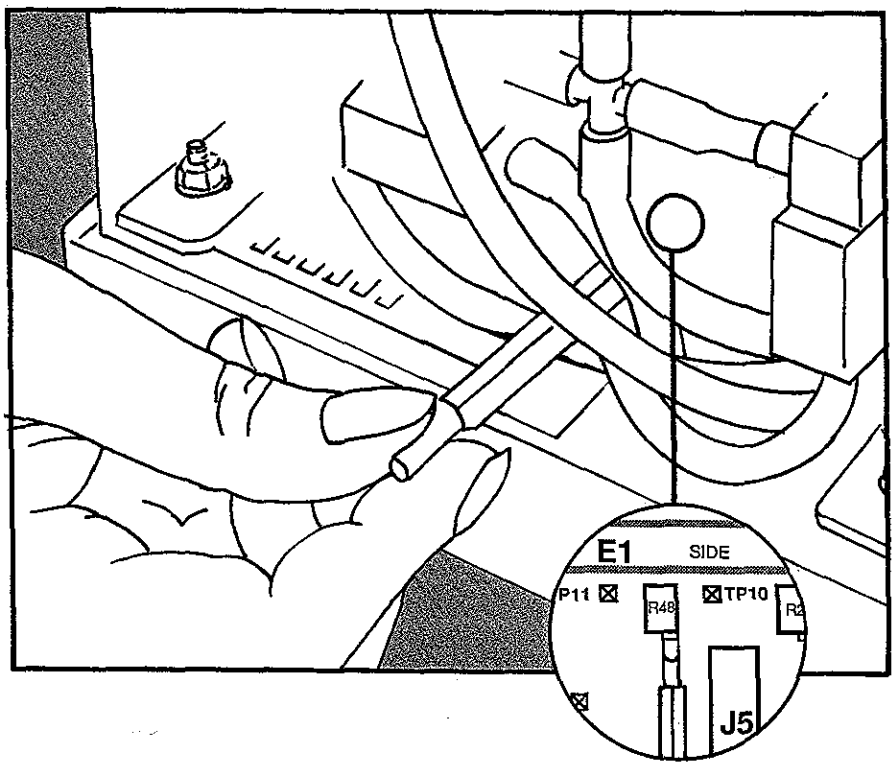


Figure 5-16. Precision Reference Voltage Adjustment

Perform the following procedure:

1. Using a long voltmeter probe, connect the positive lead to TP11 on the CPU board as shown in Figure 5-17.
2. Connect the negative lead of the meter to the outside connector JP 19 on the bottom of the CPU board (refer to Figure 5-23).
3. Ensure that a charged battery is installed in the monitor or that the AC power supply is connected and the switch on the rear of the monitor is turned on (1 position).
4. Press the **ON** switch on the front of the monitor.

5.5.3
Precision Reference Voltage Adjustment
Continued

5. The voltmeter should read +4.50 Vdc, ±0.01 Vdc. Adjust R48 with a tuning wand as shown in Figure 5-16 to obtain this reading. On early units it may be necessary to remove the monitor frame containing the power supply and pneumatics board and install the extender cables listed in Table 5-2 since R48 is inaccessible with the frame attached on these units.

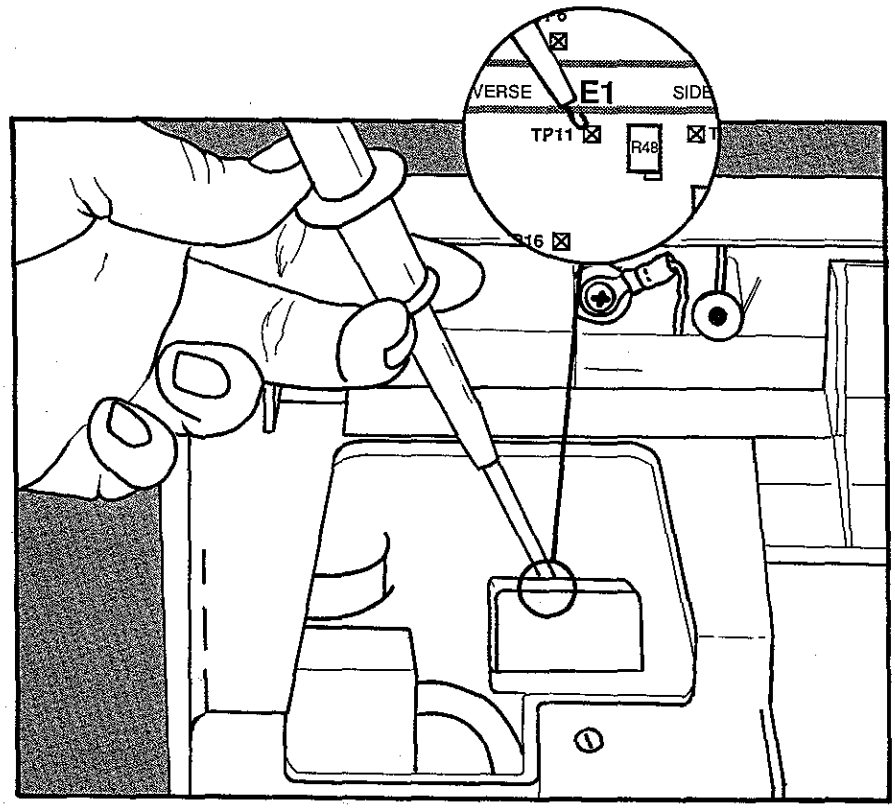


Figure 5-17. Precision Reference Voltage Test Point

5.5.4
Pressure Calibration Adjustment

If the Pressure Calibration Check reveals that a pressure calibration adjustment is necessary, first perform the Precision Reference Voltage Adjustment as outlined in paragraph 5.5.3. The pressure calibration adjustment involves a reiterative adjustment of the transducer zero adjustment (R33 on the CPU board) and the transducer scale adjustment (R20 on the CPU board) and utilizes the pressure displays on the front panel with the monitor in calibration mode 2.

5.5.4
Pressure Calibration Adjustment
Continued

Perform the following procedure:

1. Obtain the calibration kit (Part Number 320-246) supplied with the unit.
2. Connect a mercury manometer (Baumanometer 300, or equivalent) to the monitor using the parts supplied with the calibration kit as shown in Figure 5-10. Open the pressure release valve on the inflation bulb.
3. Plug the monitor into the specified line power outlet.
4. Press and hold the **SET** switch while pressing the **POWER ON** switch. The unit will turn on, and enter calibration mode 1.
5. Press **SET** to enter calibration mode 2.

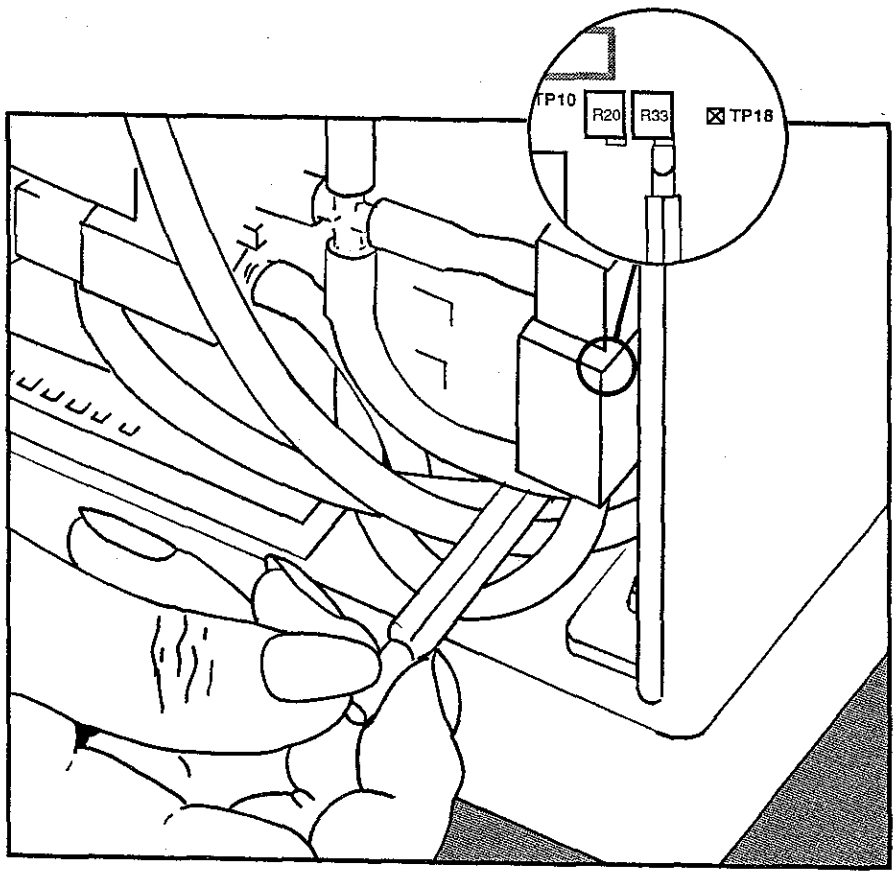


Figure 5-18. Pressure Transducer Zero Offset Adjustment

5.5.4
Pressure Calibration Adjustment
Continued

6. The **PULSE** display will show the zero offset value in A-to-D units. This should be in the range of -18 to -32 (optimally -25 at room temperature). The **PULSE** display is updated only after an auto-zero is performed so after each adjustment to R33 the monitor must be looped through the calibration modes and returned to calibration mode 2 to show the new setting. Adjust R33 as shown in Figure 5-18 (clockwise to decrease the offset, counterclockwise to increase the offset) for a reading of -25.

7. Close the pressure release valve on the manometer inflation bulb and slowly pump up the pressure to 200 mmHg as indicated by the mercury manometer.

8. Adjust R20 on the CPU board as shown in Figure 5-19 until the **TEMPERATURE** display indicates 200.

9. Press SET until calibration mode 2 is re-entered and repeat steps 6 through 8.

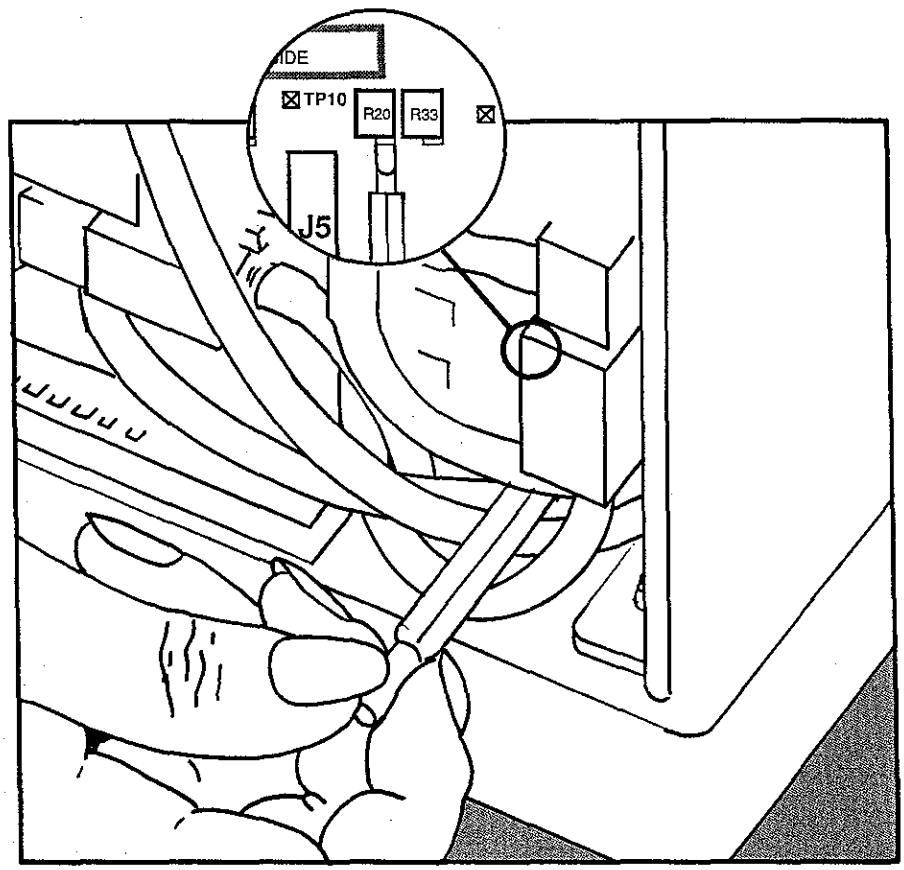


Figure 5-19. Pressure Transducer Scale Adjustment

5.5.5 Overpressure Switch Adjustment

The overpressure switch on the pneumatics board is set at the factory to trigger an 800 system alarm whenever cuff pressure reaches 310 mmHg, ±45 mmHg. If it is determined during the Overpressure Safety Check (paragraph 5.4.4) that the overpressure switch is not functiong properly, perform the following adjustment procedure:

1. Obtain the calibration kit (Part Number 320-246) supplied with the unit

2. Connect a mercury manometer (Baumanometer 300, or equivalent) to the monitor using the parts supplied with the calibration kit as shown in Figure 5-10. Open the pressure release valve on the inflation bulb.

3. Plug the monitor into the specified line power outlet.

4. Press and hold the **SET** switch while pressing the **POWER ON** switch. The unit will turn on, and enter calibration mode 1.

5. Close the pressure release valve on the manometer inflation bulb and *slowly* pump up the pressure while observing the mercury manometer and note at what pressure the 800 alarm is generated.

6. Locate the recessed hexagonal set screw in the overpressure switch as shown in Figure 5-20 and, using the 0.050 " Allen wrench, adjust the set screw to change the pressure at which the overpressure switch trips. Turning the screw clockwise increases the pressure at which the switch trips. Turning the screw counterclockwise decreases the pressure at which the switch trips

5.5.5 Overpressure Switch Adjustment
Continued

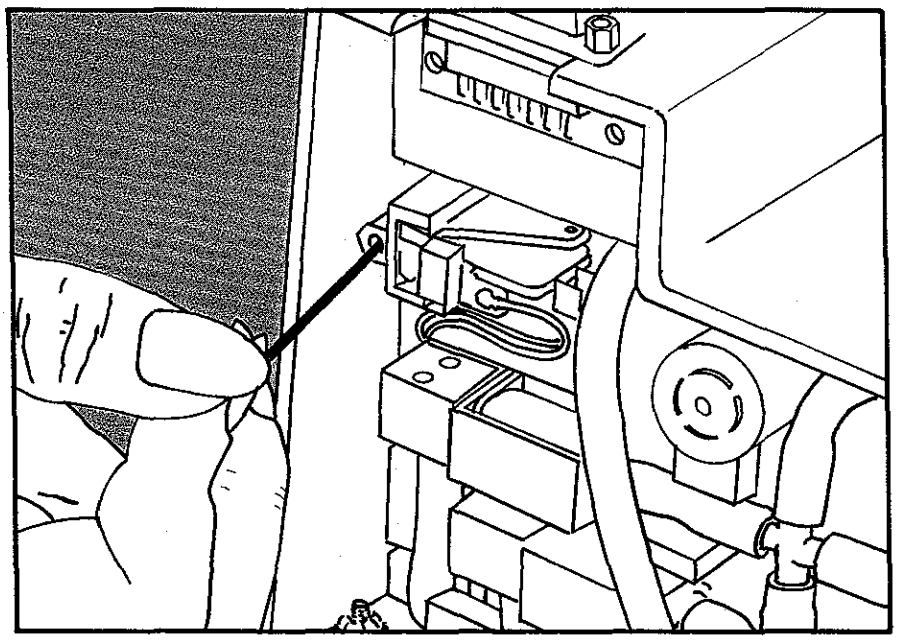


Figure 5-20. Overpressure Switch Adjustment

5.5.6 Temperature Circuit Adjustments

Calibration of the temperature detection circuits requires adjustments be made to R37 and R42 located on the foil side of the Display Board as shown in Figures 5-21 and 5-22.

Perform the following steps:

1. Obtain the Calibration Plug (Critikon Part Number 320-438) as shown in Figure 5-12.

2. Connect the Calibration Plug to the front panel **PROBE** connector as shown in Figure 5-13.

CAUTION

DO NOT twist the Calibration Plug when inserting or removing it since this may damage the precision resistors contained within the plug.

3. Connect the Universal Counter (Model 9902) to the CPU input pin at JP22 on the CPU board and set the counter to measure period.

5.5.6
Temperature Circuit Adjustments
Continued

4. Turn the Model 8100T on and enter Calibration Mode 5 (refer to section 5.3).

5. Adjust R37 on the foil side of the Display Board as shown in Figure 5-21 for a period of 3135 microseconds, +0/-10 microseconds, as displayed on the counter and record the displayed value.

6. Select Channel 1 to the temperature converter by pressing the front panel **HIGH LIMIT** switch twice.

7. Add 27.0 microseconds to the value recorded in step 5 and adjust R42 as shown in Figure 5-22 for a reading on the counter of this calculated period, ±1.0 microsecond. This completes the temperature calibration.

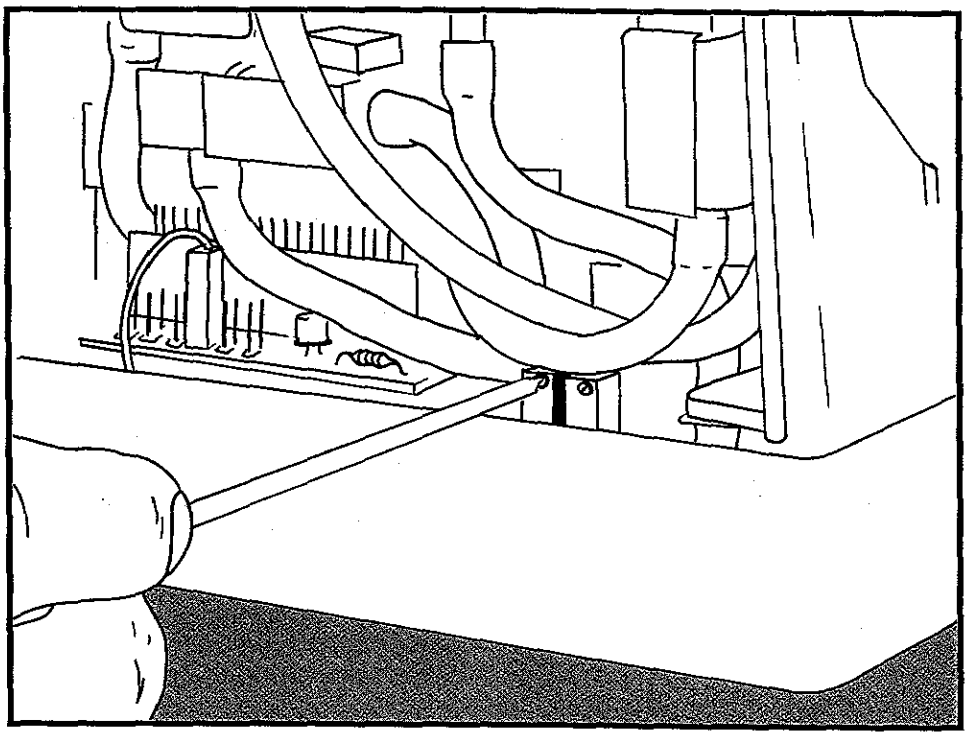


Figure 5-21. Temperature Detector VFC Scale Adjustment (R37)

5.5.6
Temperature Circuit Adjustments
Continued

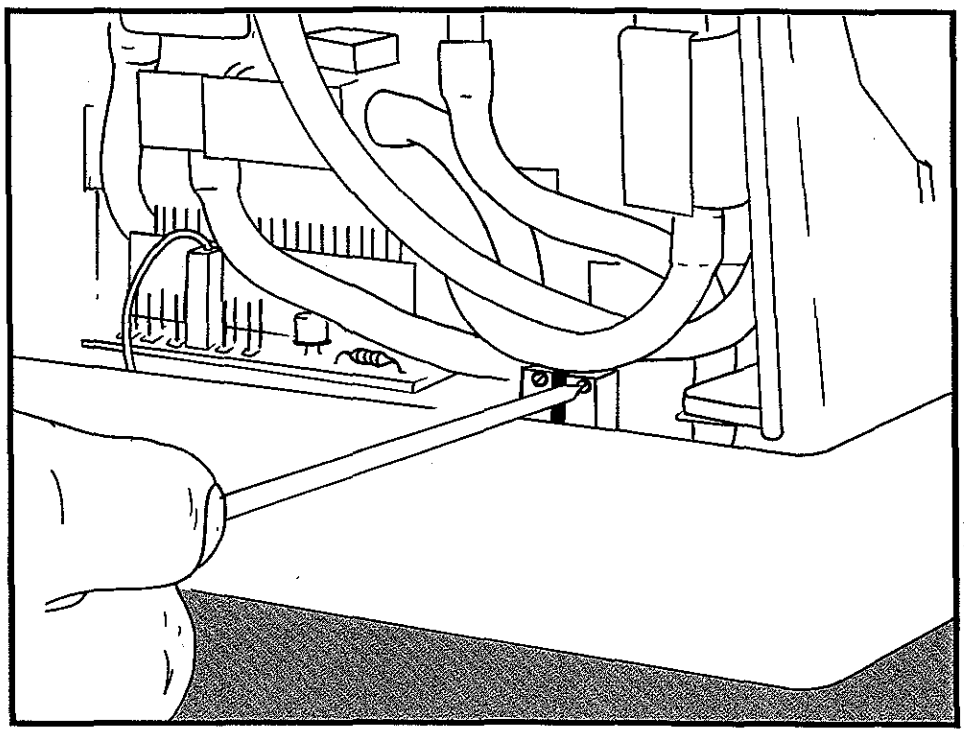


Figure 5-22. Temperature Detector Internal Calibration Adjustment (R42)

5.6 INSTALLING/ REMOVING JUMPER OPTIONS

Jumper options are accessible at the bottom of the CPU board as shown in Figure 5-23. These are identified on the board as JP11, JP12, JP19, JP20, JP21 and JP22. The jumpers are inserted by placing a jumper-header (Critikon Part Number 607-297) over the staked pins. Only two of the jumpers are used, JP19 and JP20. JP22 provides the connection for the temperature VFC output from the Display Board.

When the jumper-header is inserted over the staked pins of **JP19**, the pressure displays will show pressure in kilopascals and the **kPa** indicators will be lighted on the front panel.

When the jumper-header is installed over the staked pins of **JP20**, the **SYSTOLIC** display will show only cuff pressure during a stepped deflation instead of multiplexing the cuff pressure with the previous determined systolic pressure.

5.6 INSTALLING/ REMOVING JUMPER OPTIONS
Continued

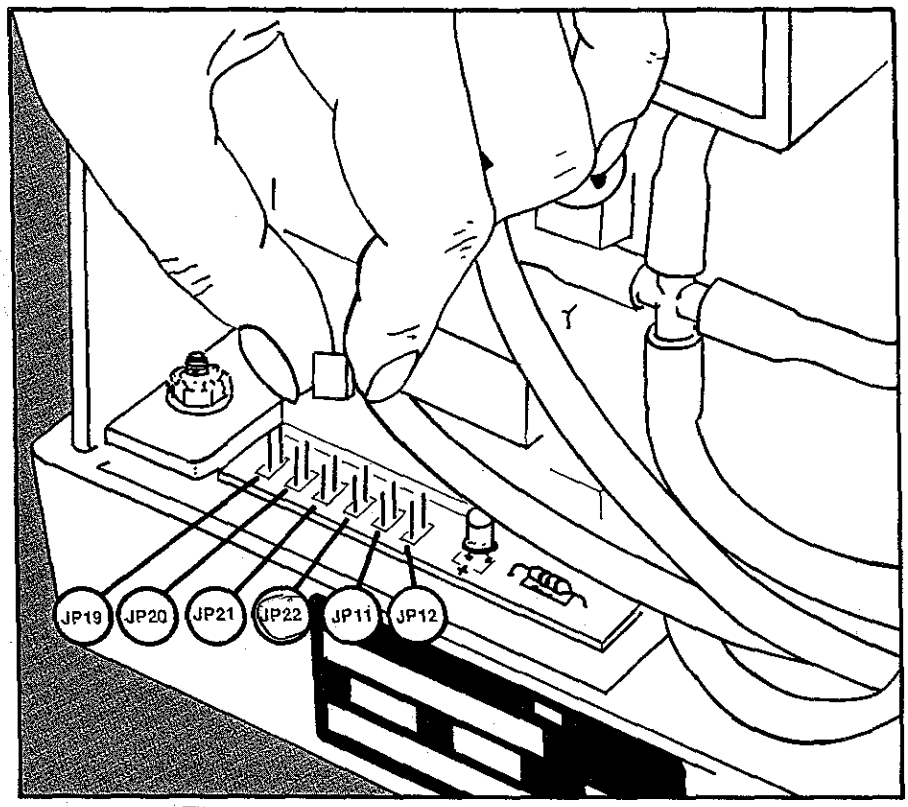


Figure 5-23. CPU Board Jumper Options

5.7 ALARM CODE INTERPRETATION

5.7.1 Blood Pressure System (800 Series) Alarms

When, for some reason external to the microprocessor system, the monitor is unable to make a blood pressure determination it blanks all vital signs displays, flashes an 800 series alarm code in the **PULSE** display, and sounds the audio alarm in an ascending fashion just as for the vital signs limit alarms. Some alarms can be silenced by pressing the **SILENCE** switch, some cannot. All can be canceled. These alarms are as follows:

800 - EXCESS PRESSURE. This alarm is generated when the pneumatic system pressure is sensed by the monitor to be greater than 310 ± 45 mmHg in adult mode or greater than 235 ± 10 mmHg in neonatal mode. It is usually caused by a kinked or pinched hose or cuff lead, or by a quick violent patient movement or squeezing of the cuff. It can also be caused by an internal pneumatic system blockage or obstruction or a failure of one of the pneumatic valves. This alarm cannot be silenced by pressing **SILENCE** but may be canceled by pressing **CANCEL**. If external causes are ruled out and the alarm persists, check the integrity of the overpressure switch contacts and the voltage level of the digital input (OP-1) at the A/D converter on the CPU board.

833 - CUFF INFLATION TIME OVER 40 SECONDS. This alarm is generated when the pneumatic pump cannot reach the target pressure within 40 seconds. It is usually caused by a leak in the cuff, cuff tubes, cuff connector, hose, or hose connector. It can also be caused by an internal pneumatic system leak or failure of one of the pneumatic valves. This alarm can be silenced by pressing **SILENCE** or canceled by pressing **CANCEL**. If external causes are ruled out and the alarm persists, check the integrity of the pneumatic valves and circuits on the pneumatics board and the digital control signals from the CPU board.

844 - DETERMINATION TIME OVER 120 SECONDS. This alarm is generated when the monitor senses that a determination has not been completed and 120 seconds have elapsed since the determination was initiated. It is usually caused by a leak in the cuff, cuff tubes, cuff connector, hose, hose connector, or excessive motion artifact. It can also be caused by an internal pneumatic system leak or failure of one of the pneumatic valves. This alarm can be silenced by pressing **SILENCE** or canceled by pressing **CANCEL**. If external causes are ruled out and the alarm persists, check the integrity of the pneumatic valves and circuits on the pneumatics board and the digital control signals from the CPU board.

5.7.1 Blood Pressure System (800 Series) Alarms Continued

855 - AT ONE PRESSURE LEVEL OVER 60 SECONDS. This alarm is generated when the monitor senses that the pneumatic system pressure has remained at one pressure level, either because no matched pulses were found or despite efforts to step down the pressure. It is usually caused by excessive motion artifacts or arrhythmia, or it may be a kinked or pinched cuff tube or hose. It can also be caused by an internal pneumatic blockage or valve failure. This alarm can be silenced by pressing **SILENCE** or canceled by pressing **CANCEL**. If external causes are ruled out and the alarm persists, check the integrity of the pneumatic valves and circuits on the pneumatics board and the digital control signals from the CPU board.

888 - NORMAL POWER UP INDICATION OR POWER INTERRUPTION. This is the normal indication when power is first applied to the monitor and lasts only for four or five seconds to test the seven-segment numeric displays. It should only occur when the **POWER ON** switch is pressed when the monitor is **OFF**. If this alarm occurs during any other time, it is an indication that power has been temporarilly interrupted and is cause to suspect a hardware malfunction in the power supply board or battery connections.

899 - WEAK PULSE OR INSUFFICIENT SIGNAL. This alarm is generated when the monitor is unable to detect a signal strong enough to make a determination. The most appropriate response would be to check the patient since the patient's pulse may be weak or non-existent. Make sure the cuff is wrapped around and secured firmly to the patient's limb. This alarm can be silenced by pressing **SILENCE** or canceled by pressing **CANCEL**. If external causes are ruled out and the alarm persists, check the operation of the AUTO ZERO valve on the pneumatics board to ensure that the cuff is being ported to the pressure transducer on the CPU board.

5.7.2 Temperature System (E00 Series) Alert Codes

When, for some reason external to the microprocessor system, the monitor is unable to make a temperature determination it flashes an E00 series alert code in the **TEMPERATURE** display (Monitor mode only). The temperature alert codes are as follows:

E00 - EXCESS DETERMINATION TIME. This alert code is generated if the temperature determination time exceeds 60 seconds.

E11 - LOSS OF TISSUE CONTACT. This alert code is generated when a loss of tissue contact occurs. It is usually caused when the probe is removed before the temperature determination is complete.

E33 - PROBE PROBLEM. This alert code can only occur in NORMAL mode when the probe assembly is not connected or continuity is broken in the probe or probe connector circuits.

5.7.3 Internal Error (900 Series) Alarms

Internal diagnostics are continually run by the monitor to detect certain hardware faults before they have a chance to affect accuracy or efficacy. In addition there are software traps programmed into the monitor to detect any software errors. The occurrence of any hardware or software error will cause the monitor to flash a 900 series alarm code in the **PULSE** display and sound a continuous, high-level audio alarm which cannot be silenced or canceled. The software errors are undefined in this document since they cannot be repaired in the field and should be referred to Critikon Field Service for correction. The hardware error codes are as follows:

901 - TIME BASE COMPARISON ERROR. At least twice a second the microprocessor compares the CPU clock frequency with the clock frequency of the Failsafe Timer circuit and, if the frequency of either clock is off by more than ±0.5 %, it generates this alarm.

902 - INTERNAL JUMPER ERROR. This error code indicates that one or more jumpers are configured wrong for normal operation and is an indication that certain calibration or test jumpers have been left in the unit after maintenance or test procedures have been performed.

911 - PLUS 5 VDC SUPPLY OUT-OF-LIMITS. This error code indicates that the +5 Vdc supply is out of tolerance.

912 - PLUS 8 VDC SUPPLY OUT-OF-LIMITS. This error code indicates that the +8 Vdc supply is out of tolerance.

913 - MINUS 6 VDC SUPPLY OUT-OF-LIMITS. This error code indicates that the -6 Vdc supply is out of tolerance.

922 - PRESSURE CHANNEL ERROR BEFORE AUTO-ZERO. This error code indicates that the uncorrected transducer output is outside the range of 1 to 50 a-to-d units.

923 - PRESSURE CHANNEL ERROR AFTER AUTO-ZERO. This error code indicates that the auto zero operation failed to establish a zero offset.

924 - MINUS 50 OFFSET PRESSURE CHANNEL ERROR. This error code indicates that the internal offset for high pressure levels is outside the range of 49 to 53 A-to-D units.

925 - OSCILLATION CHANNEL TEST FAILURE. This error code indicates that the unit has failed the oscillation channel (FPT) test.

926 - AUTO-ZERO VERIFICATION ERROR. This error code indicates that the unit has failed the auto-zero verification test at the end of a determination.

5.7.3
Internal Error (900 Series) Alarms
Continued

927 - TEMPERATURE CALIBRATION ERROR (54°). This error code indicates that the unit has failed the temperature calibration test performed periodically by the software. Specifically, the reading of temperature channel 0 failed to give a reading of 54° F.

928 - TEMPERATURE CALIBRATION ERROR (98°). This error code indicates that the unit has failed the temperature calibration test performed periodically by the software. Specifically, the reading of temperature channel 1 failed to give a reading of 98° F.

929 - TEMPERATURE CALIBRATION ERROR (108°). This error code indicates that the unit has failed the temperature calibration test performed periodically by the software. Specifically, the reading of temperature channel 2 failed to give a reading of 108° F.

930 - TEMPERATURE PROBE TYPE CODE ERROR. This error code indicates that there is a problem with the probe type code (oral/rectal) circuitry in the probe or the probe connector.

966 - RAM TEST FAILURE. This error code indicates that the unit has failed the periodic RAM test routine.

970 - DIAGNOSTIC LOADER CHECKSUM ERROR. This error code indicates that the monitor has detected a checksum error during the download of the diagnostic program.

977 - ROM CHECKSUM ERROR. This error code indicates that the unit has failed the periodic ROM test routine.

SECTION 6. SERVICE DIAGRAMS & PARTS LISTS

6.1 INTRODUCTION

This section of the manual provides the engineering drawings and service diagrams necessary to maintain the equipment and to order replacement parts. Each Illustrated Parts Breakdown (IPB) drawing is preceded by the Parts List pertaining to it.

These illustrations are listed in the List of Illustrations in the front matter of this manual and are repeated here for your convenience:

FIGURE NUMBER	FIGURE TITLE
6-1	Top Assembly, Model 8100T
6-2	Sub-Top Assembly, Model 8100T
6-3	Bezel Assembly, Model 8100T
6-4	Air Pump Assembly, Model 8100T
6-5	Transformer Assembly, Model 8100T
6-6	AC Power Connector Assembly, Model 8100T
6-7	Display Board Printed Wiring Assembly
6-8	CPU Printed Wiring Assembly
6-9	Power Supply Printed Wiring Assembly
6-10	Pneumatic Printed Wiring Assembly

6.2 LIST OF APPLICABLE ENGINEERING DRAWINGS

The applicable engineering drawings are contained at the end of this section and are in order by drawing number. The following is a list of the drawings contained in this section:

DRAWING TITLE	DRAWING NUMBER
Schematic, Display PWA	SC315-288
Schematic, CPU PWA	SC315-293
Schematic, Power Supply PWA	SC315-291
Schematic, Pneumatics PWA	SC315-292

8100T TOP ASSEMBLY

(Refer to Figure 6-1)

ITEM	DESCRIPTION	PART NUMBER
1	Sub-Top Assembly, Domestic	351-051
	Sub-Top Assembly, English	351-052
	Sub-Top Assembly, French	351-053
	Sub-Top Assembly, Japanese	351-054
2	Label, Caution/Warning, English	730-226
	Label, Caution/Warning, French	730-228
	Label, Caution/Warning, Japanese	730-248
3	Case Assembly, Includes:	334-090
	3A, Case, Modified	321-102
	3B, Screw, Battery Door	704-633
	3C, Battery Door	759-178
	3D, Clamp, Battery Door	704-632
TRUE CONNECT BUTTON →	3E, Fastener, Probe Holder	752-194
	3F, Nut, Cap	716-135
	3G, Bumper, Black	732-141
4	Label, Alarm Code, English	730-454
	Label, Alarm Code, French	730-415
	Label, Alarm Code, Japanese	730-416
5	Label, Operating Precaution, English	730-469
	Label, Operating Precaution, French	730-501
	Label, Operating Precaution, Japanese	730-414
6	Label, Patent	730-264
7	Label, Prescription Device, Domestic	730-431
8	Label, Fuse Warning, (Domestic)	730-232
	Label, Fuse Warning (British)	730-380
	Label, Fuse Warning (French)	730-246
	Label, Fuse Warning (Japanese)	730-369
9	Screw, 6-32 x 1/2", panhead, Phillips, ss	719-439
10	Screw, 10-32 x 1-1/8", flathead, Phillips	719-257
11	Knob, Pole Clamp	759-183

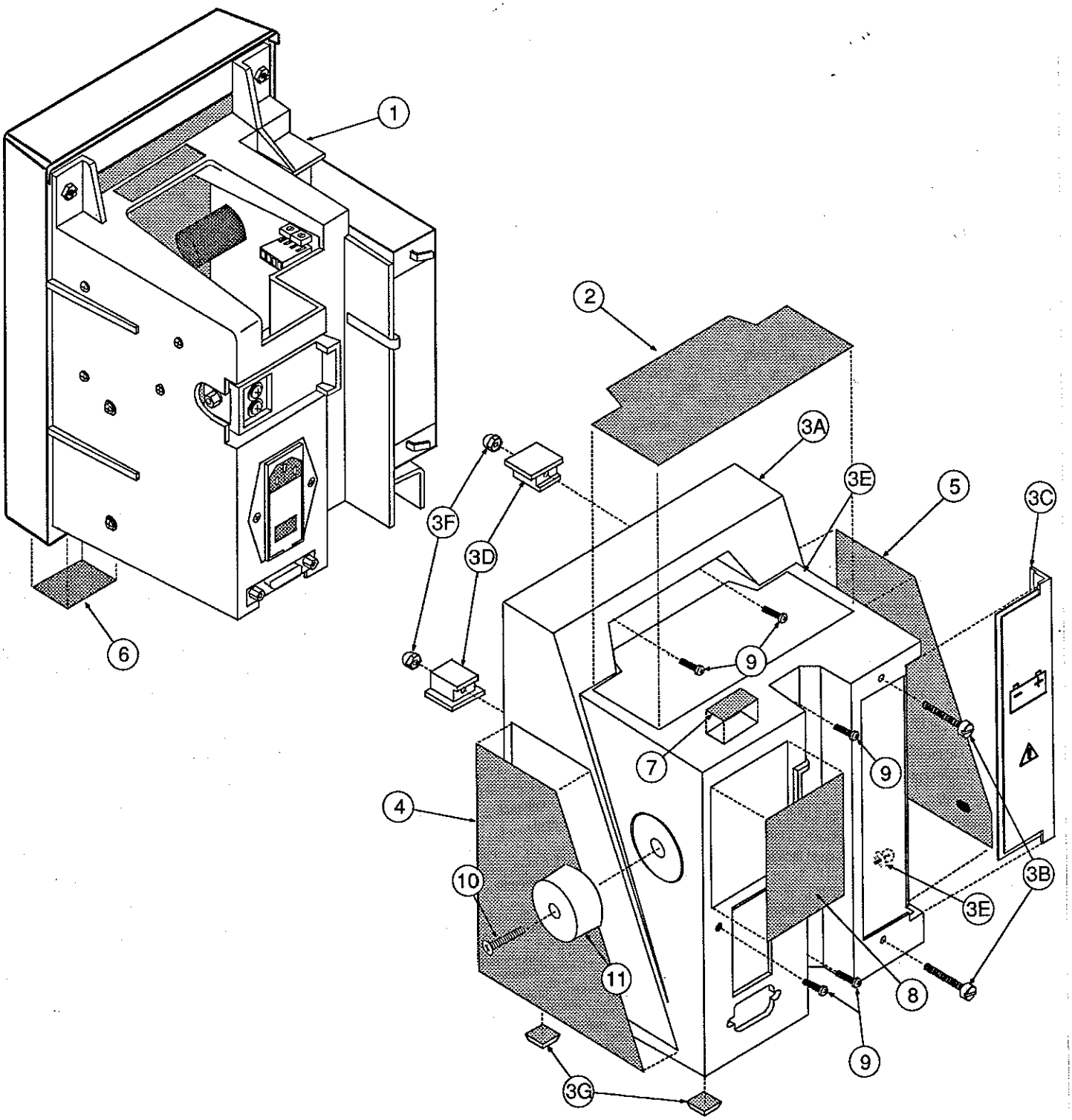


Figure 6-1.
Top Assembly
DINAMAP™ Monitor Model 8100T

8100T SUB-TOP ASSEMBLY
(Refer to Figure 6-2)

ITEM	DESCRIPTION	PART NUMBER
1	Battery Assembly	320-378
2	Bezel Assembly, English	332-172
	Bezel Assembly, French	332-173
	Bezel Assembly, Japanese	332-174
3	Pump Assembly	320-413
4	Power Supply PWA,	315-291
5	Frame, Molded	759-176
6	Pneumatics PWA	315-292
7	Transformer Assembly, 100V	320-434
	Transformer Assembly, 120V	320-432
	Transformer Assembly, 230V(French)	320-433
	Transformer Assembly, 230V(British))	320-424
8	AC Power Connector Assembly, British	320-422
	AC Power Conn. Assy., Domestic, French, Jap	320-431
9	Pole Clamp Assembly (including pad)	320-400
	9a, Pole Clamp Friction Pad	750-153
10	Screw, 6-32 x 3/8, panhead,ss	719-111
11	Screw, left hand pole clamp	704-646
12	Screw, 4-40 x 1/2, flat head, ss	719-153
13	Screw, 6-32 x 1/4, pan head, ss	719-103
14	Jack screw, 3/16 hex , with attach. hardware	722-138
15	T-Nut, pole clamp	704-643
16	Washer, flat, #6	723-103
17	Screw, 8-32 x 1, pan head, ss	719-225
18	Washer, flat, #8	723-104
19	Screw, 6-32 x 5/16, flat head, ss	719-147
20	Cable Assemby, Battery-to-Power Supply	316-341
21	Thrust Plate, pole clamp	704-647
22	Software Assembly	365-101
23	Fuse, 1/2 AMP, 250V, fast acting (dom. & Jap)	628-109
	Fuse, 1/4 AMP, 250V, fast acting (Eng. & Fr.)	628-132
24	Fuse Holder, 3AG	617-110
	Fuse Holder, Metric	617-109
25	Washer, 0.312 OD, 0.150 ID, 0.062 thick	725-103
26	Nut, hex, #4	715-107
27	Washer, Split Lock, #4	724-101
28	Nut, 6-32, self-locking, nylon insert	716-401
29	Washer, flat, #4	723-102
30	Ribbon, Battery Removal, Polyester Blue	774-122
31	Battery Retention Pad, hooks	750-156
32	Battery Floor Pad	750-157
33	Power Supply Shock Pad	750-159
34	Label, Battery Fuse Rating	730-324
35	Label, Battery Reorder	730-231
36	Clip, plastic self adhesive	752-192
37	Contact Strip, ESD shielding	608-189
38	Nut, hex, #6 stainless steel	715-108

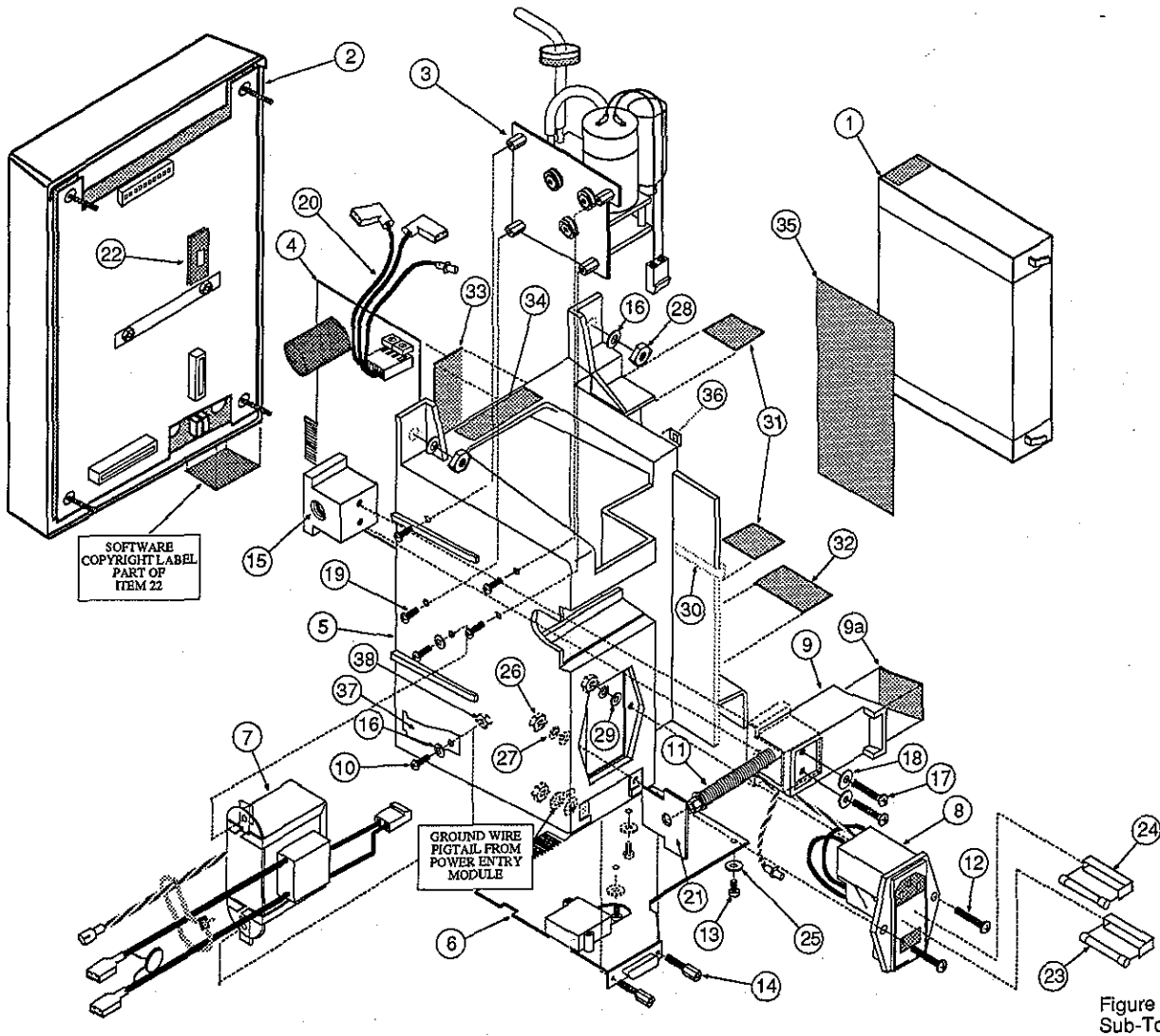


Figure 6-2.
Sub-Top Assembly
DINAMAP™ Monitor Model 8100T

8100T BEZEL ASSEMBLY
(Refer to Figure 6-3)

ITEM	DESCRIPTION	PART NUMBER
1	Filter, 43 micron disposable airline	754-118
2	Nut, hex, small pattern, #6, stainless	715-103
3	Nut, hex, special 5/16 x 24, brass	715-117
4	Screw, 6-32 x 1 1/2", panhead, Phillips, ss	719-253
5	Washer, lock, internal tooth, 5/16"	724-408
6	Panel, front, English	701-267
	Panel, front, French	701-269
	Panel, front, Japanese	701-270
7	Screwfitting, bulkhead, cuff connector	704-627
8	Bezel, Molded	759-210
9	Screw, 6-32 x 3/8", panhead, Phillips, ss	719-111
11	Printed Wiring Assembly, Display	315-288
12	Printed Wiring Assembly, CPU	315-293
13	Connector, 25-position, board stacking	607-452
14	Screw, 4-40 x 5/8", panhead, ss	719-210
15	Nut, hex, #4, stainless steel	715-107
16	Washer, lock, split, #4, stainless steel	724-101
17	Connector, header, 10-position, right angle	607-456
18	Shield, splash	759-198
19	Washer, flat, #6, stainless steel	723-103
20	Springwasher, #6, spring steel	725-116
21	Clamp, Temperature Probe Connector	704-698
22	Nut, #5/16 w/locking insert	716-137

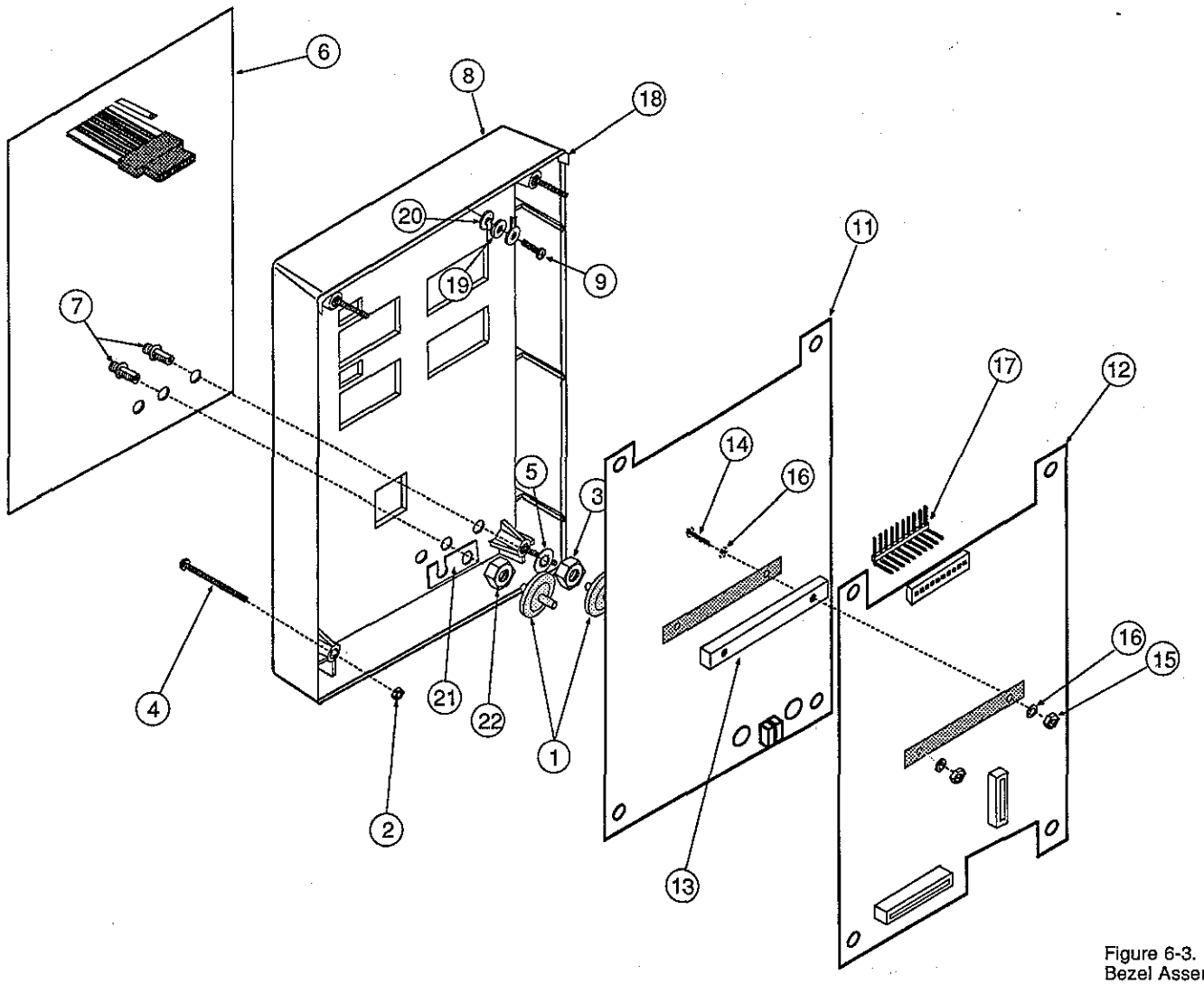


Figure 6-3.
Bezel Assembly
DINAMAP™ Monitor Model 8100T

8100T PUMP ASSEMBLY
(Refer to Figure 6-4)

ITEM	DESCRIPTION	PART NUMBER
1	Bracket, pump mounting	704-682
2	Pump, air, 12 Vdc	712-210
3	Wire, 20 AWG, stranded, PVC, blue	680-244
4	Wire, 20 AWG, stranded, PVC, white	680-247
5	Contact, crimp-on, 0.045 inch	607-461
6	Connector, housing, two position	607-459
7	Tubing, O.D. 0.250 ", I.D. 0.125"	740-107
8	Tubing, shrinkable, I.D. 0.125 ", clear	742-110
9	Muffler Assembly	320-397
10	Grommet, isolator	732-144
11	Washer, flat, #6	723-103
12	Ferrule, threaded, isolator	727-137
13	Foam Tape, double sticky	774-131
14	Checkvalve, fluid/air	754-116

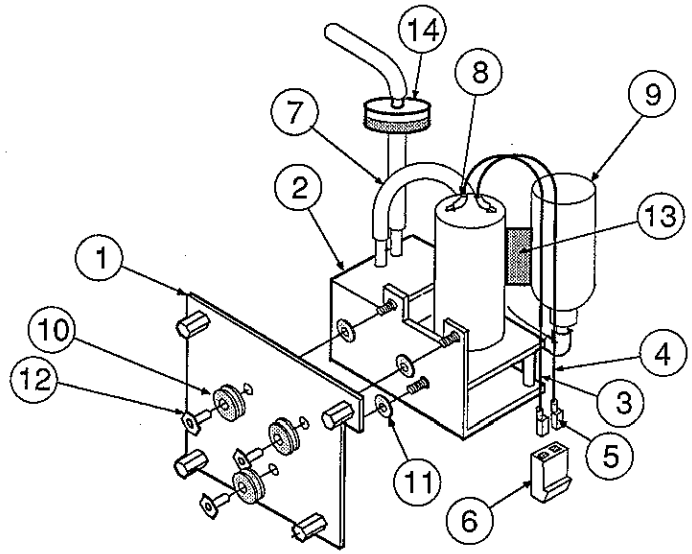


Figure 6-4.
Pump Assembly
DINAMAP™ Monitor Model 8100T

8100T TRANSFORMER ASSEMBLY
(Refer to Figure 6-5)

ITEM	DESCRIPTION	PART NUMBER
1	Transformer, 100V/120V	668-136
	Transformer, 230V	668-135
2	Fastener, Nut J-Type, #6	716-133
3	Terminal, .110x.020, Domestic, French, Japan	734-149
	Terminal, .187x.032, English	734-118
4	Contact, crimp-on, 0.045 "	607-461
5	Connector, housing, two position	607-459
6	Tubing, shrinkable, I.D. 0.125", black	742-121
7	Varistor, 130Vrms, (100V, 120V units)	628-113
	Varistor, 280Vrms, (230 V units)	628-114
8	Connector, line splice	607-310
9	Contact, crimp-on pin, 18-24AWG	608-127
10	Tyrap, Nylon, 1.250 " max bundle	756-105

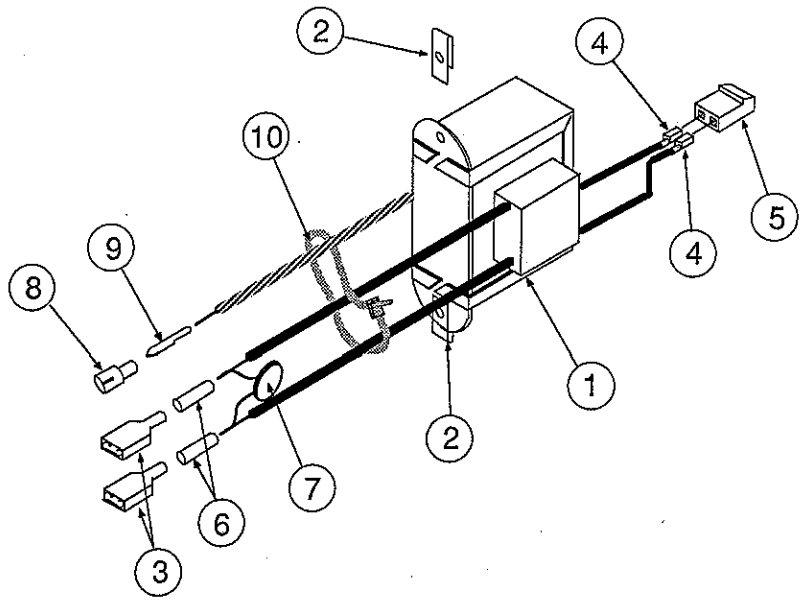


Figure 6-5.
Transformer Assembly
DINAMAP™ Monitor Model 8100T

8100T AC POWER CONNECTOR ASSEMBLY
(Refer to Figure 6-5)

ITEM	DESCRIPTION	PART NUMBER
1	Module, power entry (Dom.,French, Japan)	624-113
	Module, power entry (English)	624-112
2	Connector, line splice	607-311
3	Wire, stranded, 18AWG, black	680-221
4	Wire, stranded, 20AWG, grn/yel	680-251
5	Tubing, shrinkable, 3/16 I.D., black	742-104
6	Terminal Lug, locking, #6 hole	734-105
7	Label, IEC ground symbol	730-377
8	Contact, crimp-on socket	608-128
9	Plug, ac switch (Dom., French, Japan only)	732-146

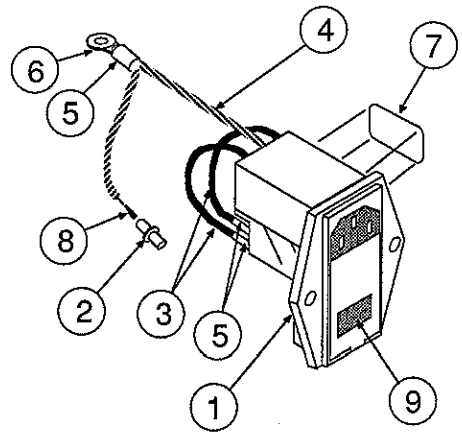


Figure 6-6.
AC Power Connector Assembly
DINAMAP™ Monitor Model 8100T

PARTS LIST,
Display Board
Printed Wiring Assembly
Reference Parts List,
PL315-288

ITEM	DESCRIPTION	PART NUMBER
C1	Capacitor, ceramic, 0.1 microfarad, 50V, ±20%	602-107
C2	Capacitor, ceramic, 56 picofarad, 50V, ±10%, axial	602-144
C3, 4	Capacitor, electrolytic, 22 microfarad, 25V	604-109
C5	Capacitor, ceramic, 1.0 microfarad, 50V, ±20%	602-175
C6	Capacitor, polycarbonate, 0.15 microfarad, ±5%	603-181
C7	Capacitor, tantalum, 22 microfarad, 25V, ±20%	603-167
C8	Capacitor, ceramic, 1.0 microfarad, 50V, ±20%	602-175
C9, 10	Capacitor, ceramic, 0.0039 microfarad, 50V, ±5%	602-199
C11	Capacitor, tantalum, 4.7 microfarad, 35V, ±10%	603-149
C12, 13	Capacitor, ceramic, 1.0 NF, 20%, 3 KVDC	602-204
CR1-4	Diode, switching, 200 mA, 75V, 4 pF, 1N4148	610-104
DS1, 32	Display, LED, 7-segment, red	614-156
DS3, 10, 17 18, 19, 33	Display, LED, 7-segment, red	614-123
DS5, 7, 8	Display, LED, 7-segment, yellow	614-139
DS16,30, 34 36	Display, LED, 7-segment, yellow	614-155
DS21, 25, 26, 29, 37-39	Lamp, LED, green, diffused	614-146
DS27, 28, 43	Lamp, LED, yellow, diffused	614-147
DS31, 35, 40-42	Lamp, LED, yellow, rectangular	614-124
L1	Inductor, 2-line common mode choke	669-141
Q1, 2	Transistor, NPN, Amplifier, 2N4401	674-102
R1, 4-6, 12, 15-17,28,61	Resistor, Carbon Film, 6.2k ohm, ±5%, 1/4W	650-171
R2, 3, 8-11, 13,14	Resistor, Carbon Film, 51k ohm, ±5%, 1/4W	650-162
R7	Resistor, Carbon Film, 62k ohm, ±5%, 1/4W	650-172
R18-24, 27	Resistor, Metal Film, 10 ohm, ±1%, 1/8W	652-205
R25, 26	Resistor, Carbon Film, 100k ohm, ±5%, 1/4W	650-104
R29, 31, 33-35	Resistor, Carbon Film, 150 ohm, ±5%, 1/4W	650-117
R30, 36,39	Resistor, Carbon Film, 510 ohm, ±5%, 1/4W	650-186
R32	Resistor, Carbon Film, 510 ohm, ±5%, 1/4W	650-186
R37	Potentiometer, 1k ohm, 1/2W, ±10%, 15 turn	630-174
R38	Resistor, Metal Film, 1.74k ohm, ±1%, 1/8W	652-322
R40*	Resistor, Metal Film, 6.81k ohm, ±0.1%, 1/8W	652-324
R41*	Resistor, Metal Film, 15.0k ohm, ±0.1%, 1/8W	652-323
R42	Potentiometer, 20k ohm, 1/2W, ±10%, 15 turn	630-187
R43	Resistor, Metal Film, 499k ohm, ±1%, 1/8W	652-161

ITEM	DESCRIPTION	PART NUMBER
R44, 66*	Resistor, Metal Film, 1.07k ohm, ±0.1%, 1/8W	652-327
R46*	Resistor, Metal Film, 511 ohm, ±0.1%, 1/8W	652-329
R47, 64*	Resistor, Metal Film, 4.99k ohm, ±0.1%, 1/8W	652-326
R48*	Resistor, Metal Film, 750 ohm, ±0.1%, 1/8W	652-328
R49	Resistor, Metal Film, 2.15k ohm, ±0.1%, 1/8W	652-325
R50, 51, 56	Resistor, Carbon Film, 10k ohm, ±5%, 1/4W	650-103
R52	Resistor, Carbon Film, 3k ohm, ±5%, 1/4W	650-143
R53	Resistor, Carbon Film, 1 ohm, ±5%, 1/4W	650-207
R54, 55	Resistor, Metal Film, 1k ohm, ±1%, 1/8W	652-101
R57, 58	Resistor, Carbon Film, 1k ohm, ±5%, 1/4W	650-102
R62	Resistor, Carbon Film, 22M ohm, ±5%, 1/4W	650-246
R 63	Resistor, Metal Film, 100 ohm, 1%, 1/8W	652-211
R 65	Resistor, Metal Film, 10k ohm, 1%, 1/8W	652-102
T1	Transformer, DC/DC, 1:1.2	668-140
U1	I.C., CMOS, octal D-type Flip-Flop, 74HCT374	619-185
U2, 3	I.C., quad pnp transistor array, TPQ2907	621-195
U4	I.C., CMOS, quad D-type Flip-Flop, 74HCT175	619-184
U5, 6	I.C., octal NPN Darlington drivers, ULN2803	620-149
U7, 8	I.C., 3-to-8 decoder, 74HC238	619-183
U9, 10	I.C., linear quad op amp, 324	621-141
U12	I.C., CMOS NAND gate, 74HC00	619-180
U13	I.C., CMOS multivibrator, 4538	619-123
U14	I.C., CMOS inverting octal D-type Flip-Flop, 74HCTLS534	619-213
U15	I.C., programmable voltage reference, TL431	621-194
U16	I.C., CMOS voltage-to-frequency converter, AD654	619-212
U17	I.C., CMOS 8-chan multiplexer/demultiplexer	619-113
U18, 19, 20	I.C., Optocoupler isolator, 4N35	625-112
	Bumper, black, 0.5" square	732-141
	Cable Assembly, Display Board to Temp. Probe Conn.	316-339
	Cable Assembly, Display Board to CPU Board	316-340
	contact, EMI Shield	704-702
	Nut, hex, 4-40	715-107
	Printed Circuit Board	640-259
	Screw, 4-40x1/4, pan head	719-102
	Socket, 15 position, single in-line elevated	607-312
	Socket, 12 position, single in-line	607-559
	Socket, 3 position, single in-line	607-563
	Staked Post, 0.025 " Square	608-138
	Standoff, LED, 0.430 " high	735-232
	Washer, split lock, #4	724-101

* - These resistors may be replaced with the following:

R45	Resistor, Network, 25 ppm ,1%, 16	607-563

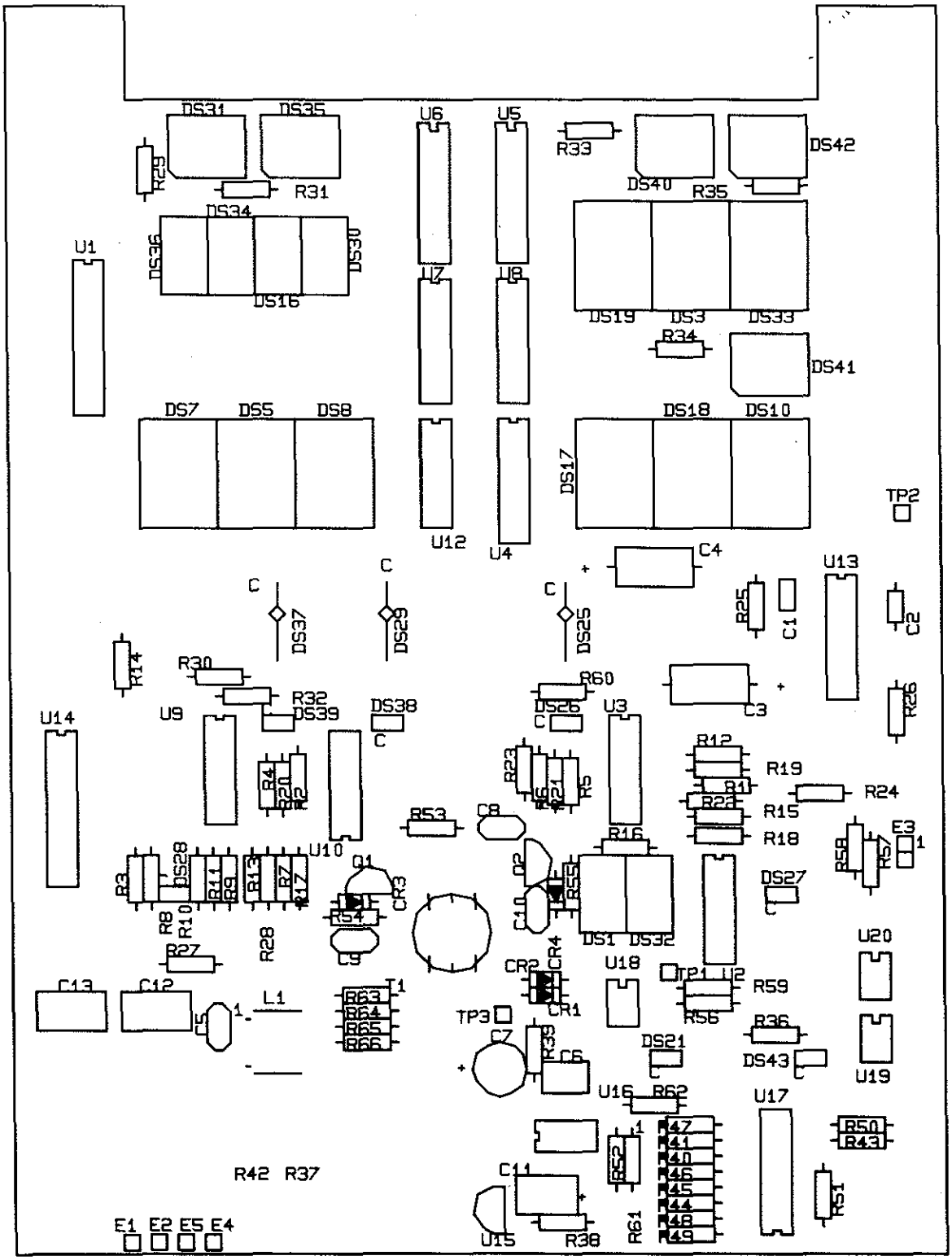


Figure 6-7. Illustrated Parts Breakdown, Display Printed Wiring Assembly

PARTS LIST,
CPU Board
Printed Wiring Assembly
Reference Parts List,
PL315-254

ITEM	DESCRIPTION	PART NUMBER
C1, 3	Capacitor, ceramic, 39 picofarad, ±10%, 50V, axial	602-128
C2 ,4 ,5 , 7, 8, 10, 11, 14-19, 26-29, 33, 34, 36	Capacitor, ceramic, 0.1 microfarad, ±20%, 50V	602-107
C5	Capacitor, ceramic, 0.1 microfarad, ±20%, 50V	602-107
C6	Not Used	
C9	Capacitor. ceramic, 10,000 picofarad, ±10%, 50V, axial	602-169
C12	Capacitor, ceramic, 33 picofarad, ±10%, 50V, axial	602-142
C13	Capacitor, ceramic, 1 microfarad, ±10%, 50V	602-175
C20, 21	Capacitor, polyester, 0.1 microfarad, ±5%, 100V	603-113
C22, 23	Capacitor, polyester, 1 microfarad, ±5%, 100V	603-114
C24, 25	Capacitor, electrolytic, 100 microfarad, 25V	604-137
C30, 31	Capacitor, electrolytic, 22 microfarad, 25V	604-109
C32	Capacitor, electrolytic, 10 microfarad, ±20%, 50V	604-136
C35	Capacitor, ceramic, 82 picofarad, ±10%, 50V, axial	602-146
C100	Capacitor, ceramic, 1000 picofarad, ±10%, 50V, axial	602-158
CR1-10, 13-15	Diode, switching, 200 mA, 75V, 4 picofarad, 1N4148	610-104
CR11,12	Diode, zener, 5.1V, ±5%, 0.5W, 1N5231B	612-106
J1	Not Used	
J2	Connector, 10-position	607-455
J3	Connector, 20/40, card edge	607-453
J4	Not Used	
J5	Connector, 10/20, card edge	607-454
JP14	Jumper, header, EPROM chip select	607-297
Q1,3	Transistor, switching, NPN, 2N2222A	674-403
Q4, 5, 2	Transistor, switching, PNP, 2N2907A	674-404
Q6, 7	Transistor, VMOS, FET,VN10KM	676-105
R1	Resistor, carbon film, 470k ohm, ±5%, 1/4W	650-159
R2	Resistor, carbon film, 1.2k ohm, ±5%, 1/4W	650-111
R3,4,67,74 79-82,100	Resistor, carbon film, 10k ohm, ±5%, 1/4W	650-103
R5, 8, 9, 70 75-77	Resistor, carbon film, 1k ohm, ±5%, 1/4W	650-102
R6	Resistor, carbon film, 4.7M ohm, ±5%, 1/4W	650-198
R7, 30	Resistor, carbon film, 47k ohm, ±5%, 1/4W	650-158
R10-13	Resistor, carbon film, 20k ohm, ±5%, 1/4W	650-127
R14, 15, 25	Resistor, carbon film, 1k ohm, ±5%, 1/4W	650-102
R16	Resistor, metal film, 1.82k ohm, ±1%, 1/8W	652-125
R17	Resistor, metal film, 75.0 ohm, ±1%, 1/8W	652-251
R18, 29	Resistor, metal film, 49.9k ohm, ±1%, 1/8W	652-160

ITEM	DESCRIPTION	PART NUMBER
R19, 28	Resistor, metal film, 1k ohm, ±1%, 1/8W	652-101
R20	Potentiometer, 10k ohm, ±10%, 1/2W, 15-turn	630-148
R21, 32	Resistor, metal film, 14.3k ohm, ±1%, 1/8W	652-117
R22, 50, 71-73	Resistor, carbon film, 10k ohm, ±5%, 1/4W	650-103
R23	Resistor, metal film, 20k ohm, ±1%, 1/8W	652-128
R24, 39, 43, 45, 56, 69	Resistor, carbon film, 2k ohm, ±5%, 1/4W	650-126
R26	Resistor, metal film, 40.2k ohm, ±1%, 1/8W	652-156
R27	Resistor, metal film, 10k ohm, ±1%, 1/8W	652-102
R31, 51, 65	Resistor, metal film, 100k ohm, ±1%, 1/8W	652-103
R32	Resistor, metal film, 14.3k ohm, ±1%, 1/8W	652-117
R33	Potentiometer, 10k ohm, ±10%, 1/2W, 15-turn	630-148
R34	Resistor, carbon film, 51k ohm, ±5%, 1/4W	650-162
R35	Resistor, carbon film, 62k ohm, ±5%, 1/4W	650-172
R36	Resistor, metal film, 649 ohm, ±1%, 1/8W	652-253
R37, 38	Resistor, carbon film, 220k ohm, ±5%, 1/4W	650-132
R40, 53	Resistor, carbon film, 330k ohm, ±5%, 1/4W	650-147
R41	Resistor, metal film, 1.33k ohm, ±1%, 1/8W	652-221
R42	Resistor, metal film, 110k ohm, ±1%, 1/8W	652-108
R44	Resistor, metal film, 23,7k ohm, ±1%, 1/8W	652-135
R46	Resistor, carbon film, 750 ohm, ±5%, 1/4W	650-211
R47	Resistor, metal film, 8.06k ohm, ±1%, 1/8W	652-191
R48	Potentiometer, 1k ohm, ±10%, 1/2W, 15-turn	630-148
R49	Resistor, metal film, 10k ohm, ±1%, 1/8W	652-102
R52	Resistor, metal film, 1.15k ohm, ±1%, 1/8W	652-222
R54	Resistor, carbon film, 75k ohm, ±5%, 1/4W	650-212
R55, 58, 59 83	Resistor, carbon film, 3k ohm, ±5%, 1/4W	650-143
R57	Resistor, carbon film, 36k ohm, ±5%, 1/4W	650-152
R60-64	Resistor, metal film, 49.9k ohm, ±1%, 1/8W	652-160
R66, 84	Resistor, carbon film, 100k ohm, ±5%, 1/4W	650-104
R68	Resistor, carbon film, 5.1k ohm, ±5%, 1/4W	650-161
R78	Resistor, carbon film, 750 ohm, ±5%, 1/4W	650-211
R85	Resistor, carbon film, 470 ohm, ±5%, 1/4W	650-156
R86	Resistor, metal film, 20k ohm, ±1%, 1/8W	652-128
RP1	Resistor, network, 15 x 10k ohms	656-114
TX1	Transducer, pressure, 0 - 10 psi	662-151
U1	I.C., microprocessor, CMOS, 6309E	619-188
U2	I.C., gate array, CMOS	619-150
U3	Not Used	
U4	I.C., EPROM, 32K x8, (part of software assembly)	--------
U5	I.C., RAM, 8K x 8, CMOS, 150ns, 6264	622-139
U6	I.C., ACIA, CMOS,65C51	619-155
U7	I.C., analog-to-digital converter	619-178
U8	I.C., octal D-type flip-flop, CMOS, 74HCT374	619-185

ITEM	DESCRIPTION	PART NUMBER
U9	I.C., hex inverter, CMOS, 74HCU04N	619-159
U10	I.C., NAND gate, CMOS,74HC00	619-180
U11	I.C., 7-stage ripple counter, CMOS, 4024	619-410
U12	I.C., binary counter, 74HC4060	619-187
U13, 18	I.C., inverter, CMOS, 4049U	619-111
U14, 15, 20	I.C., quad linear op-amp, J-FET, TL084	621-126
U16	I.C., quad switch, CMOS, 211	619-128
U17	I.C., noninverting hex buffer, CMOS, 4050	619-112
U19	I.C., programmable reference voltage xsistor, TL431	621-194
Y1	Crystal, 3.6864 MHz, ±.005%	609-109
Y2	Crystal, 32.768 kHz	609-105
	Tubing, OD 0.25 ", ID 0.125"	740-107
	Tywrap, nylon	756-101
	Software Assembly (Rev. RAE) *	*365-088*
	Printed Wiring Board	640-224

* A complete replacement CPU Board with software or current revision software is available from Critikon Field Service parts department.

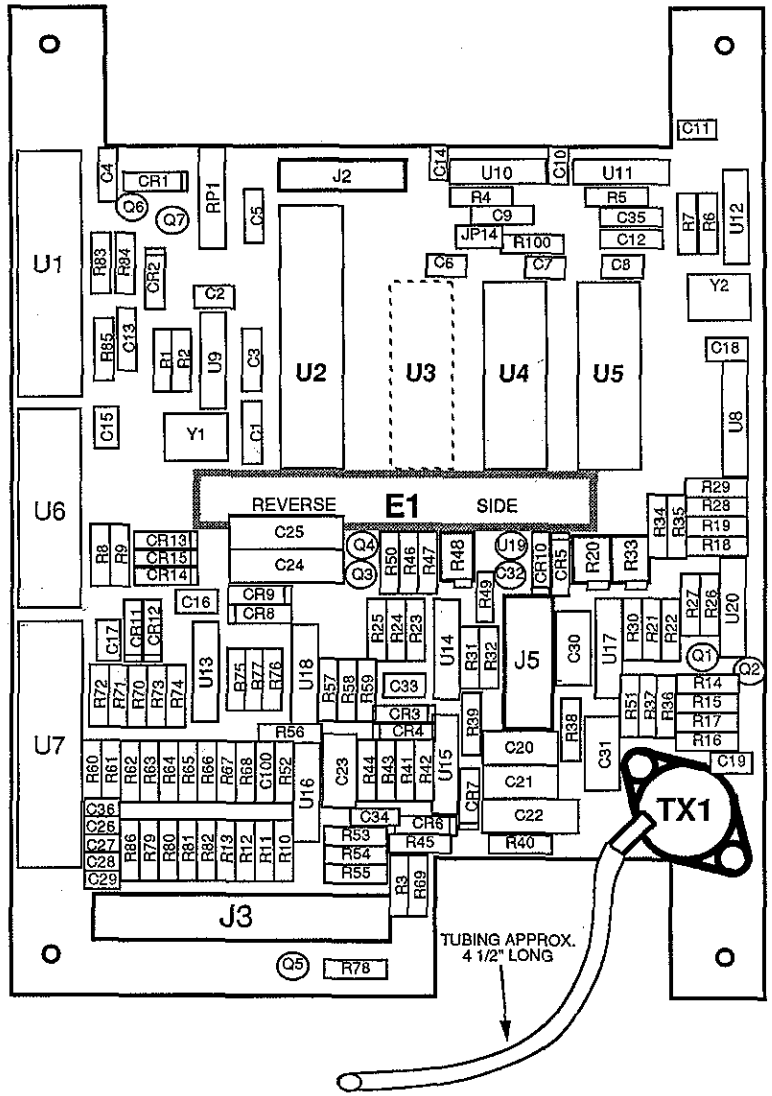
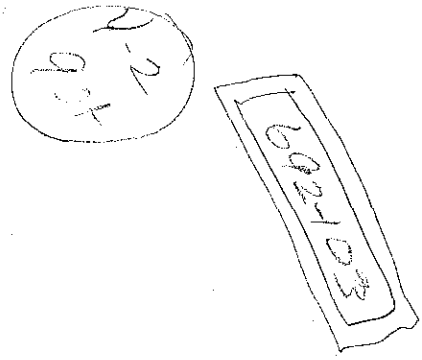


Figure 6-8. Illustrated Parts Breakdown, CPU Printed Wiring Assembly



PARTS LIST,
Power Supply
Printed Wiring Assembly
Reference Parts List,
PL315-291

ITEM	DESCRIPTION	PART NUMBER
C1	Capacitor, electrolytic, 10,000 microfarad, 35V	604-147
C2, 5, 7, 8	Capacitor, ceramic, 0.1 microfarad, ±20%, 50V	602-107
C3, 4	Capacitor, electrolytic, 100 microfarad, 35V	604-145
C6	Capacitor, polyester, 0.01 microfarad, ±5%, 100V	603-109
C9, 11	Capacitor, electrolytic, 100 microfarad, 35V	604-145
C10	Capacitor, polyester, 0.001 microfarad, ±5%, 100V	603-106
C12	Capacitor, electrolytic, 22 microfarad, 50V	603-170
C13	Capacitor, ceramic, 1 microfarad, ±20%, 50V	602-175
C14	Capacitor, ceramic, 1000 picofarad, ±10%, 50V, axial	602-158
CR1, 8, 9	Diode, rectifier, 1 amp, 400V, 1N4004	610-103
CR2, 3, 4	Diode, rectifier, 1 amp, 40V, MBR140P	611-126
CR5	Diode, rectifier, 6 amp, 50V	611-104
CR6	Diode, bridge rectifier, 1.5 amp, 50V	647-107
CR7	Diode, Zener, 14V, ±5%, 1/2W, 1N5244B	612-405
CR10	Diode, Zener, 5.6V,±5%, 1/2W, 1N5232B	612-404
CR11	Diode, switching, 200 mA, 75V, 4 picofarad, 1N4148	610-104
CR12	Not Used	
CR13, 15	Diode, Zener, 33V,±5%, 1/2W, 1N5257B	612-116
CR14	Diode, Zener, 8.7V,±5%, 1/2W, 1N5238B	612-111
F1	Fuse, 2 Amp, 250V., fast acting	628-133
J1	Connector, header, 4-postion	607-458
J3	Connector, header, 2-position	607-457
L1, 2, 3	Inductor, 680 UH, 1.0A, Axial	669-138
Q1, 3, 6, 8	Transistor, PNP, 2N2907A	674-404
Q2, 7, 10	Transistor, FET, VMOS, VN10KM	676-105
Q4, 5	Transistor, darlington pair, 2A, 50W, TIP115	673-109
Q9	Not Used	
Q11	Transistor, PNP, MPS-U51A	673-110
Q12	Transistor, NPN, 2N222A	674-403
Q13, 14	Thyristor, SCR, 12A, 50V, MCR68-2	675-105
R2, 17	Resistor, metal film, 0.56 ohm, ±5%, 1 W	653-144
R3, 8, 14, 19, 23, 37, 39	Resistor, carbon film, 1k ohm, ±5%, 1/4W	650-102
R4, 6, 18, 24	Resistor, carbon film, 2k ohm, ±5%, 1/4W	650-126
R5, 10, 35	Resistor, metal film, 10k ohm, ±1%, 1/8W	652-102
R7	Resistor, carbon film, 68k ohm, ±5%, 1/4W	650-175
R9	Resistor, carbon film, 15k ohm, ±5%, 1/4W	650-184
R11	Resistor, metal film, 2k ohm, ±1%, 1/8W	652-127
R12	Potentiometer, 1k ohm, side adjust	630-114
R13	Potentiometer, 5k ohm, side adjust	630-173
R1, 16	Resistor, carbon film, 47 ohm, ±5%, 1/4W	650-160
R20	Resistor, metal film, 8.06k ohm, ±1%, 1/8W	652-191
R 21, 29	Resistor, metal film, 4.99k ohm, ±1%, 1/8W	652-159

ITEM	DESCRIPTION	PART NUMBER
R22	Resistor, metal film, 3.01k ohm, ±1%, 1/8W	652-145
R26, 28, 44 45	Resistor, carbon film, 100 ohm, ±5%, 1/4W	650-101
R27	Resistor, metal film, 4.99k ohm, ±1%, 1/8W	652-159
R30	Resistor, carbon film, 2.7 ohm, ±5%, 1/2W	651-117
R31	Resistor, metal film, 20k ohm, ±1%, 1/8W	652-128
R32	Resistor, metal film, 10.7k ohm, ±1%, 1/8W	652-250
R33	Resistor, carbon film, 10k ohm, ±5%, 1/4W	650-103
R34	Resistor, carbon film, 220k ohm, ±5%, 1/4W	650-132
R36	Resistor, metal film, 26.1k ohm, ±1%, 1/8W	652-252
R38	Resistor, carbon film, 430 ohm, ±5%, 1/4W	650-200
R29, 40, 41	Resistor, carbon film, 27k ohm, ±5%, 1/4W	650-139
R42, 43	Resistor, carbon film, 100k ohm, ±5%, 1/4W	650-104
R*	Resistor, WW, 0.16 ohm, 3%, 3W	655-102
U1	I.C., linear comparator, LM339	621-151
U2	I.C., programmable reference, TL431	621-194
U3	I.C., pulse width regulator, SG3524	621-157
U4	I.C., programmable reference, TL431	621-194
U5	I.C., quad 2-input NAND, CMOS, 4011B	619-106
	Fuse Clip	736-403
	Printed Wiring Board	640-255
	Staked pin, 0.025" square	608-138
	Wire, 26AWG, solid, blue	680-107

* This resistor is on the back of the board.

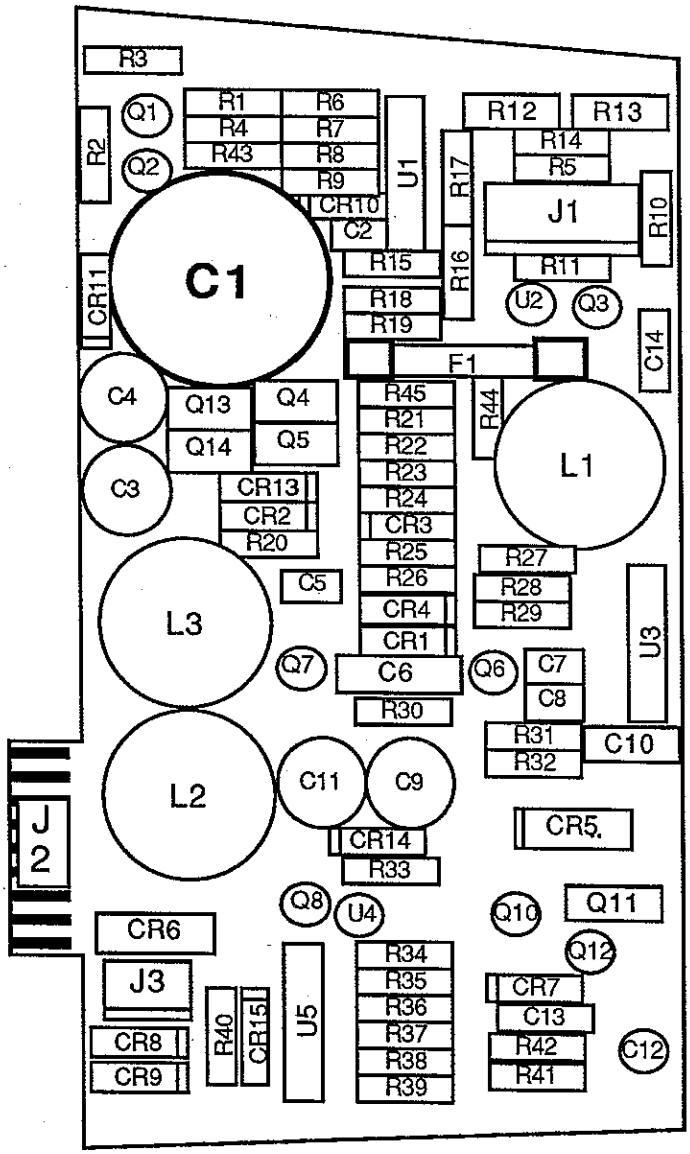
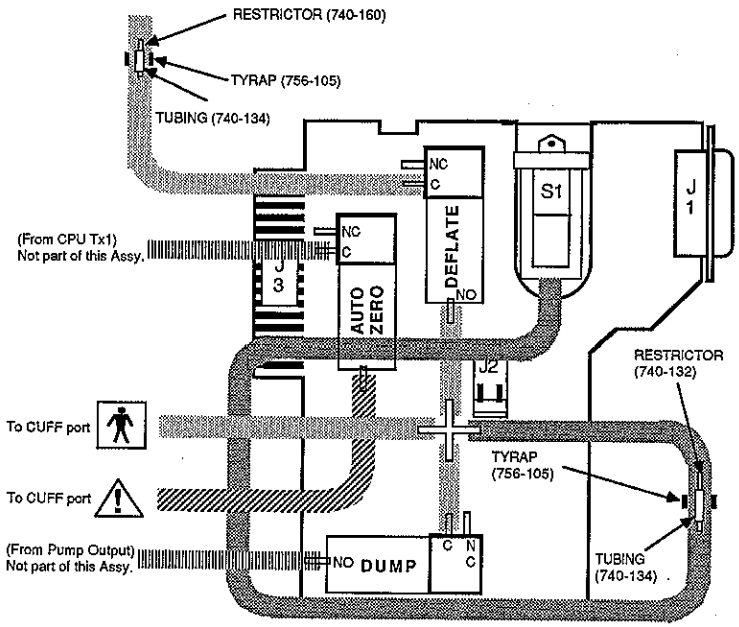


Figure 6-9. Illustrated Parts Breakdown, Power Supply Printed Wiring Assembly

PARTS LIST, Pneumatics Module Printed Wiring Assembly
Reference Parts List,
PL315-292

ITEM	DESCRIPTION	PART NUMBER
AL1	Buzzer, solid state, 3 kHz	600-114
C1, 3, 6, 16,17	Capacitor, ceramic, 0.1 microfarad, ±20%, 50V	602-107
C2, 8	Capacitor, ceramic, 1 microfarad, ±20%, 50V	602-175
C4	Capacitor, electrolytic, 22 microfarad, 50V	603-170
C5	Capacitor, polyester, 0.01 microfarad, ±5%, 100V	603-109
C7	Not Used	
C9	Not Used	
C10	Not Used	
C11	Capacitor, elect., tantalum, 2.2 microfarad, ±10%, 20V	603-141
C12, 13	Capacitor, electrolytic,10 microfarad, 50V, ±20%	604-136
C14	Capacitor, ceramic, 560 picofarad, 50V, ±10%	602-155
C15	Capacitor, ceramic, 1 microfarad, ±20%, 50V	602-175
CR1, 3, 5	Diode, switching, 200 mA, 75V, 4 picofarad, 1N4148	610-104
CR2	Diode, rectifier, 1 amp, 400V, 1N4004	610-103
CR4	Not used	
D1	Diode, zener, 7.5V, ±5%, 0.5W, 1N5236B	612-108
J1	Connector, receptacle, 15-pin, rt. angle, board mount	607-470
J2	Connector, header, 2-pin, right angle	607-462
MT1, 2, 3	Valve, Assembly, Pneumatic	320-401
Q2	Transistor, PNP, Darlington pair, 2N6040	673-108
Q1, 3, 4, 7	Transistor, FET, VMOS, VN10KM	676-105
Q5	Transistor, NPN, switching, 2N2222A	674-403
Q6	Transistor, PNP, switching, 2N2907A	674-404
R1, 13, 15, 16	Resistor, carbon film, 22 k ohm, ±5%, 1/4W	650-131
R2, 3, 9, 17, 18	Resistor, carbon film, 51 k ohm, ±5%, 1/4W	650-162
R4	Resistor, metal film, 16.2 k ohm, ±1%, 1/8W	652-225
R5	Resistor, carbon film, 10 k ohm, ±5%, 1/4W	650-103
R6	Resistor, carbon film, 5.1 k ohm, ±5%, 1/4W	650-161
R7	Resistor, carbon film, 100 k ohm, ±5%, 1/4W	650-104
R8, 10, 12	Resistor, metal film, 4.99 k ohm, ±1%, 1/8W	652-159
R11	Resistor, carbon film, 1.2 k ohm, ±5%, 1/4W	650-111
R14, 19	Resistor, carbon film, 2 k ohm, ±5%, 1/4W	650-126
R20	Resistor, carbon film, 100 ohm, ±5%, 1/4W	650-101
R21	Resistor, carbon film, 1 k ohm, ±5%, 1/4W	650-102
R22, 23, 24	Resistor, carbon film, 13 ohm, ±5%, 1 W	651-118
R25-27	Resistor, metal film, 63.4 k ohm, ±1%, 1/8W	652-164
R28	Resistor, carbon film, 470 ohm, ±5%, 1/4 W	650-156
S1	Switch, overpressure, 275 mmHg	662-157
U1	I.C., pulse width regulator, SG3524	621-157
U2	I.C., Quad, 2-input, NAND, CMOS, 4011	619-106
U3	I.C., quad, 2-input, NOR, CMOS, 4001	619-105

ITEM	DESCRIPTION	PART NUMBER
U4	I.C., voltage converter, CMOS, SI7661	621-202
	Nut, hex, #4	715-107
	Printed Wiring Board	640-254
	Restrictor, 0.030 " I.D.	740-160
	Restrictor, 0.160 " I.D.	740-132
	Screw, 4-40 x 3/8	719-110
	Screw, 4-40 x 3/4	719-125
	Tubing, 0.250 " O.D., 0.125 " I.D.	740-107
	Tubing, plastic, 0.125 " O.D., 0.062 " I.D.	740-134
	Tubing, shrink, 1/8" I.D., Black PVC	742-102
	Tyrap, nylon	756-105
	Washer, 0.281 O.D., 0.116 I.D., 0.047 " thick	725-109
	Washer, lock, split, #4	724-101
	Wire, 26 AWG, solid, blue	680-107
	"X" fitting, plastic tubing, 1/8"	754-117



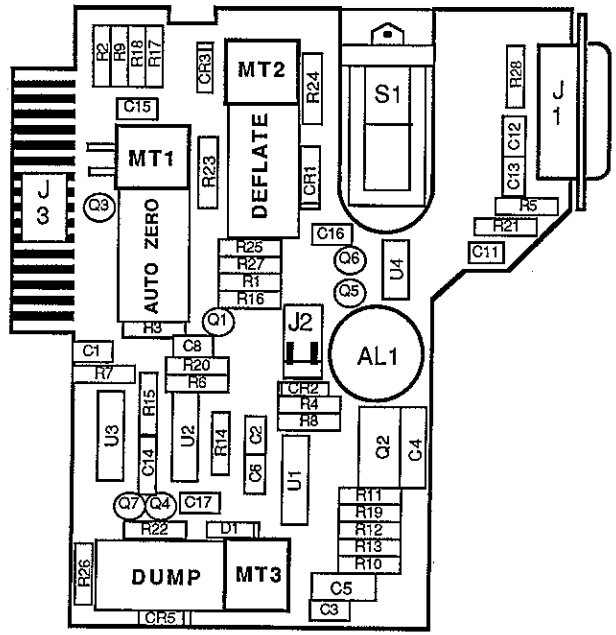
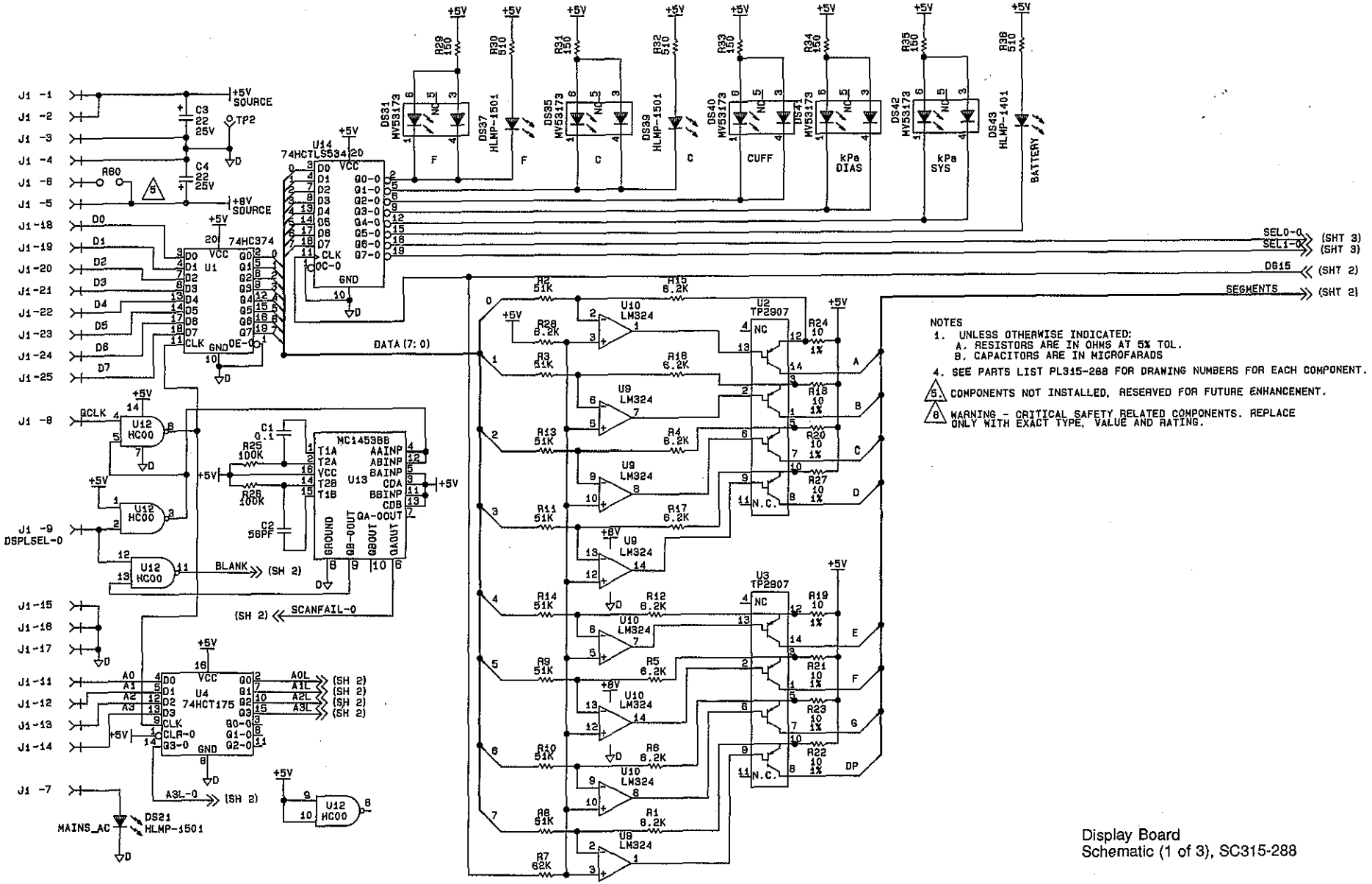
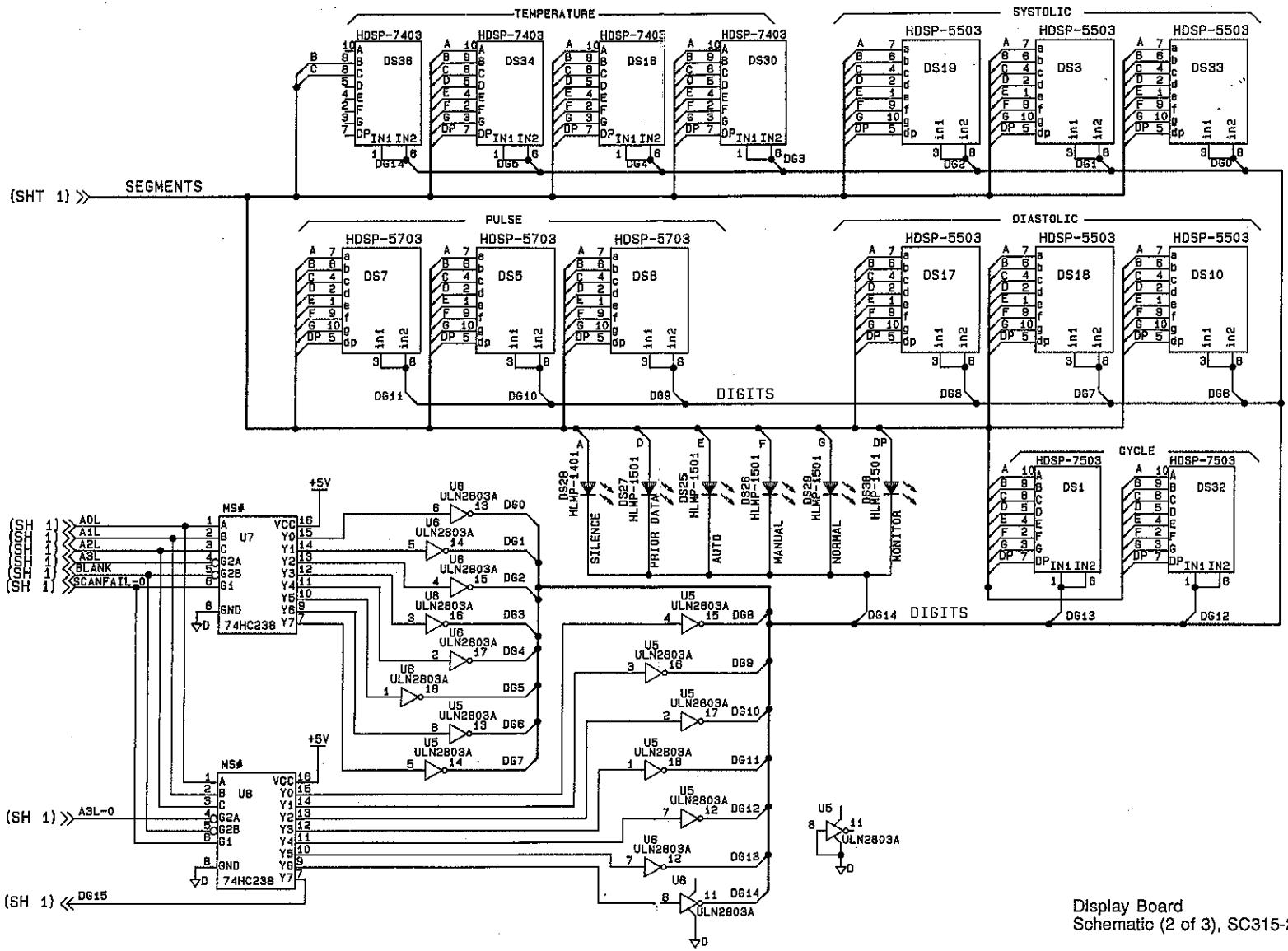


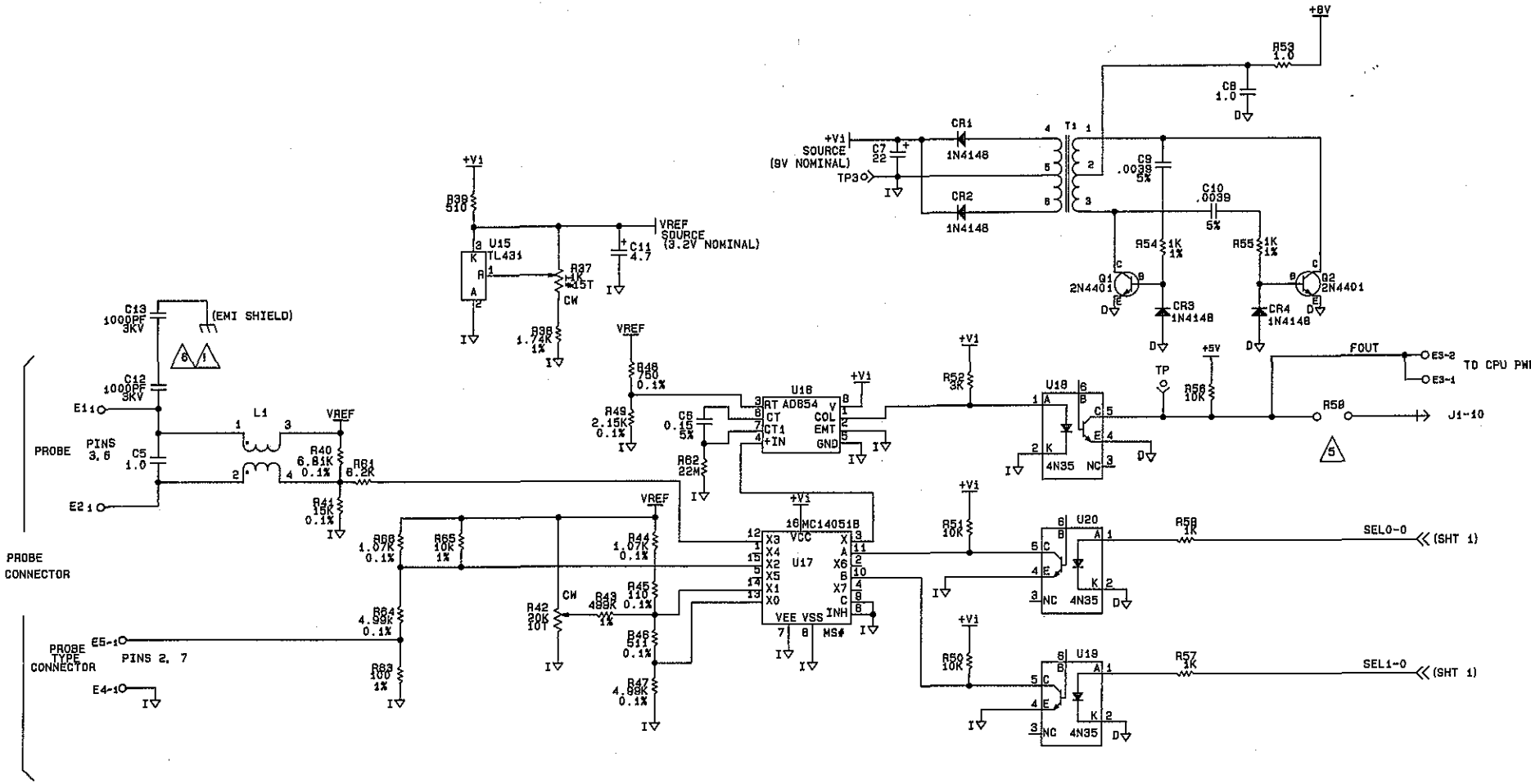
Figure 6-10.
Illustrated Parts Breakdown
Pneumatics Module PWA



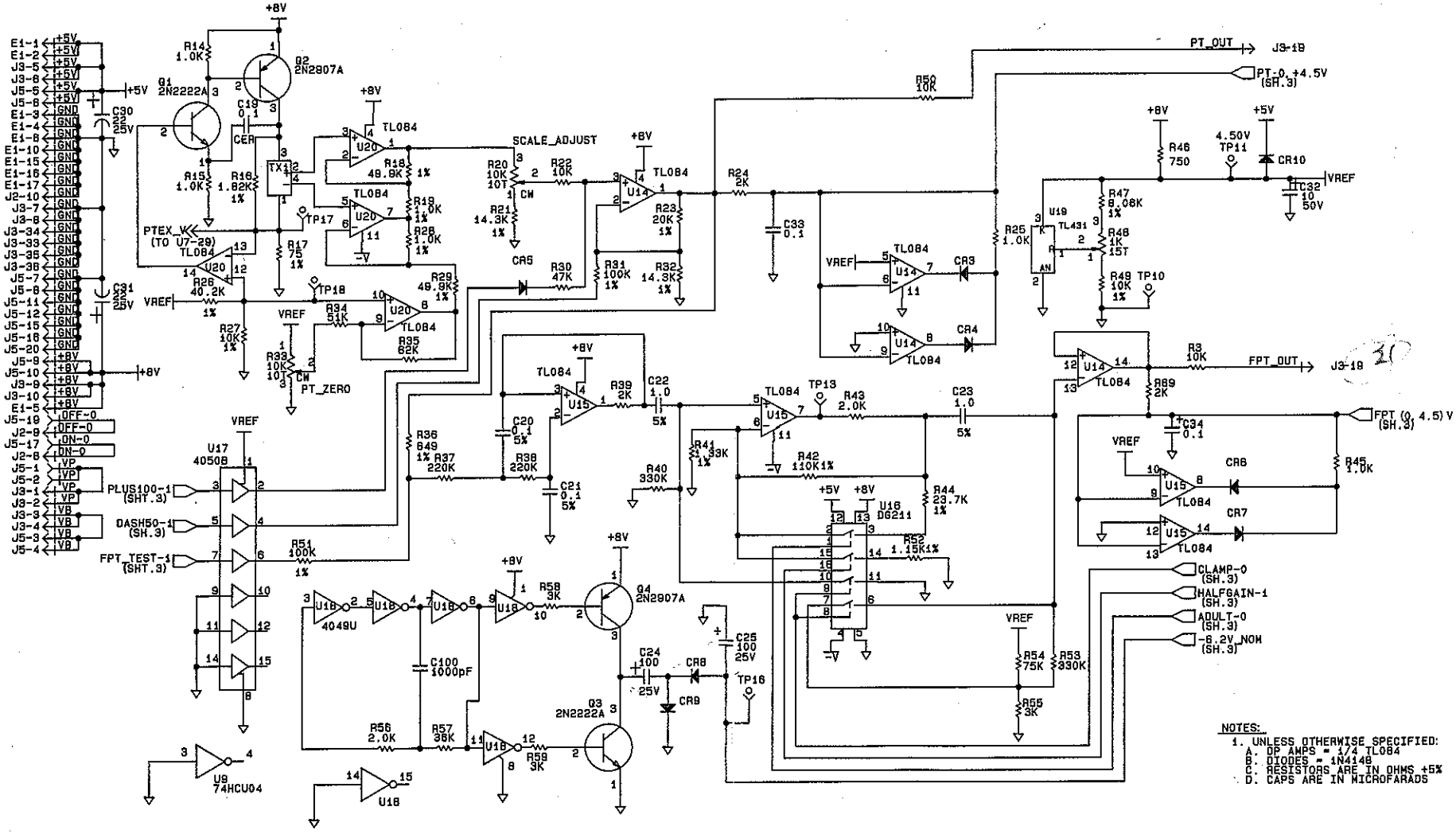
Display Board
Schematic (1 of 3), SC315-288



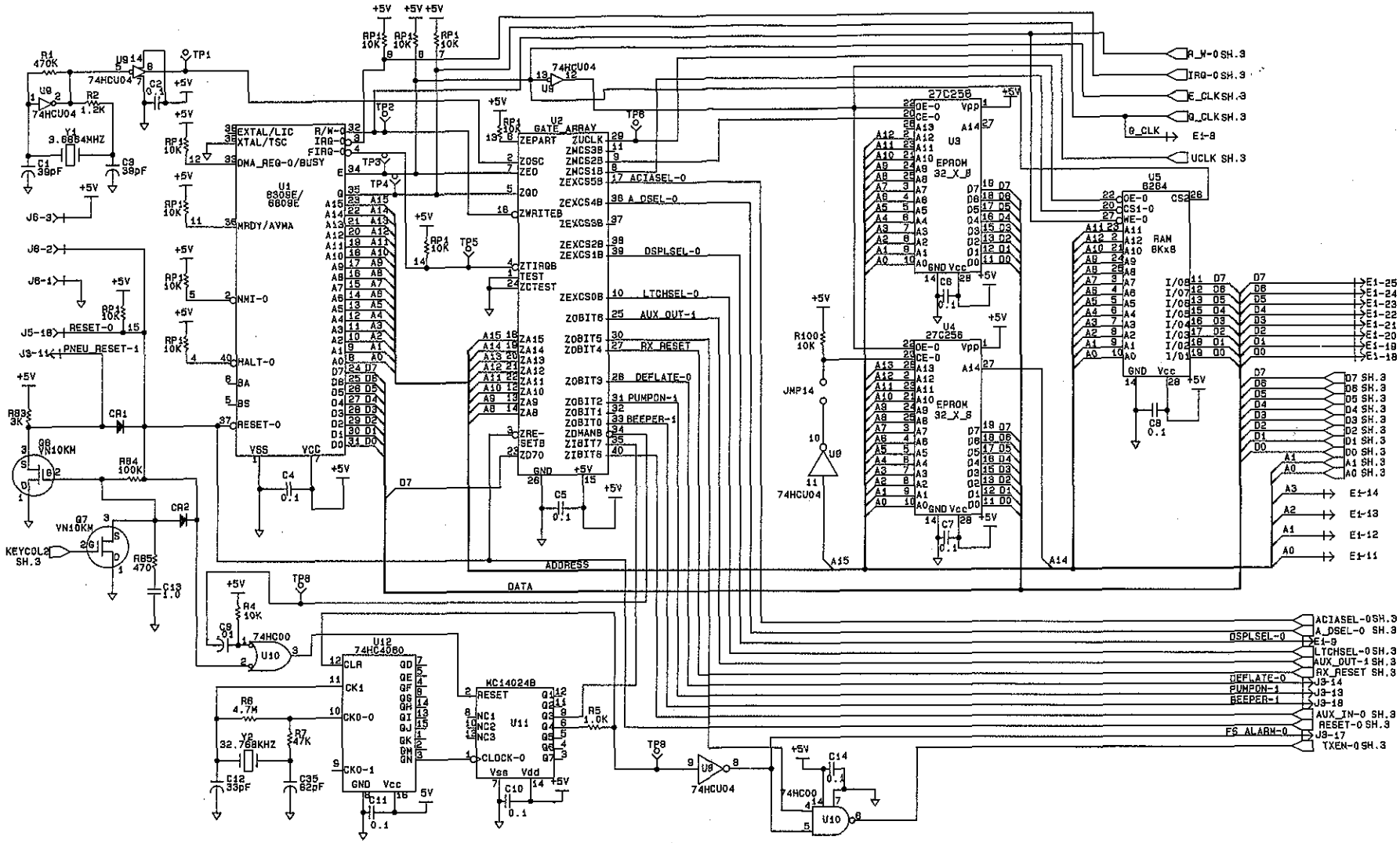
Display Board
Schematic (2 of 3), SC315-288



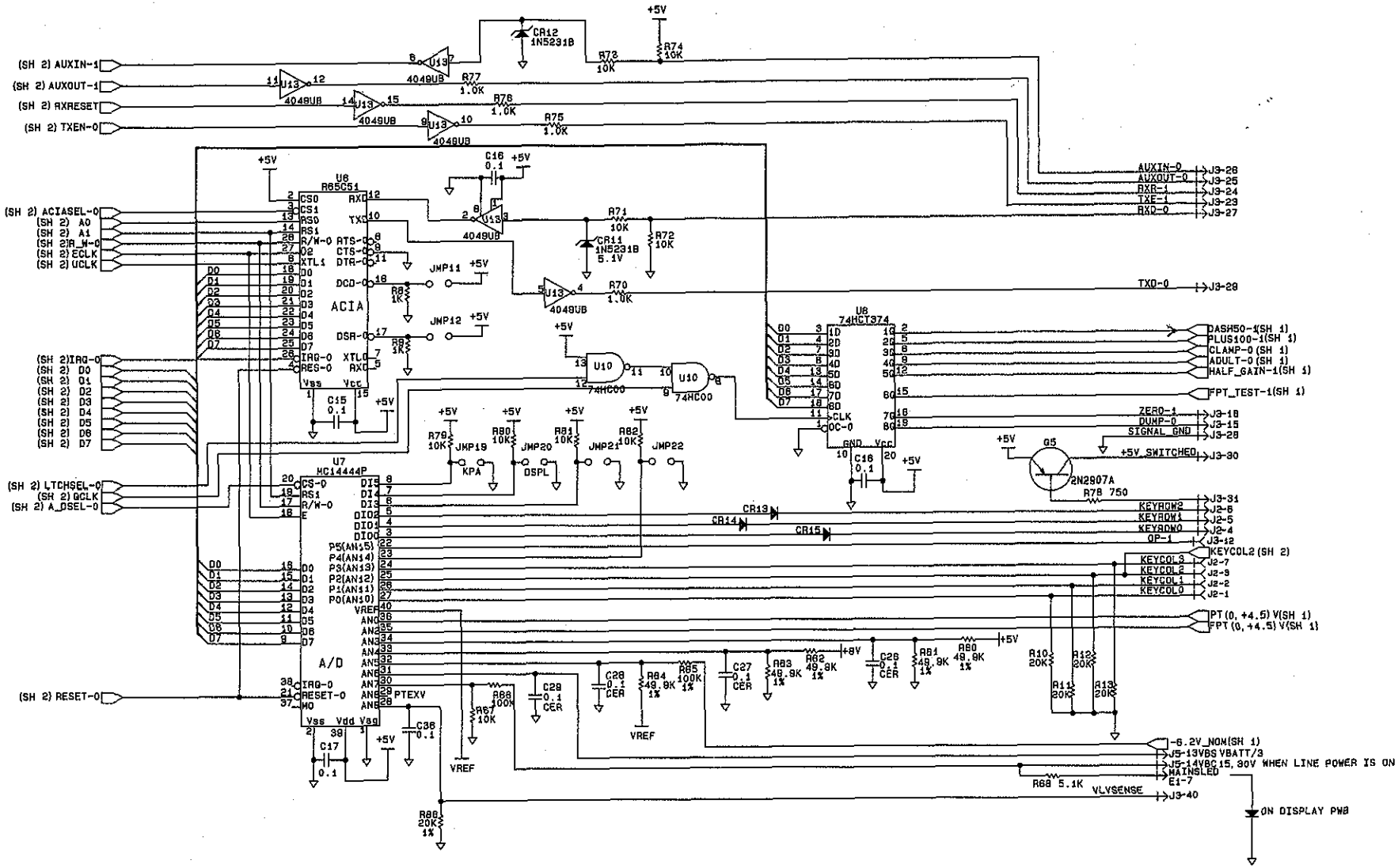
Display Board
Schematic (3 of 3), SC315-288



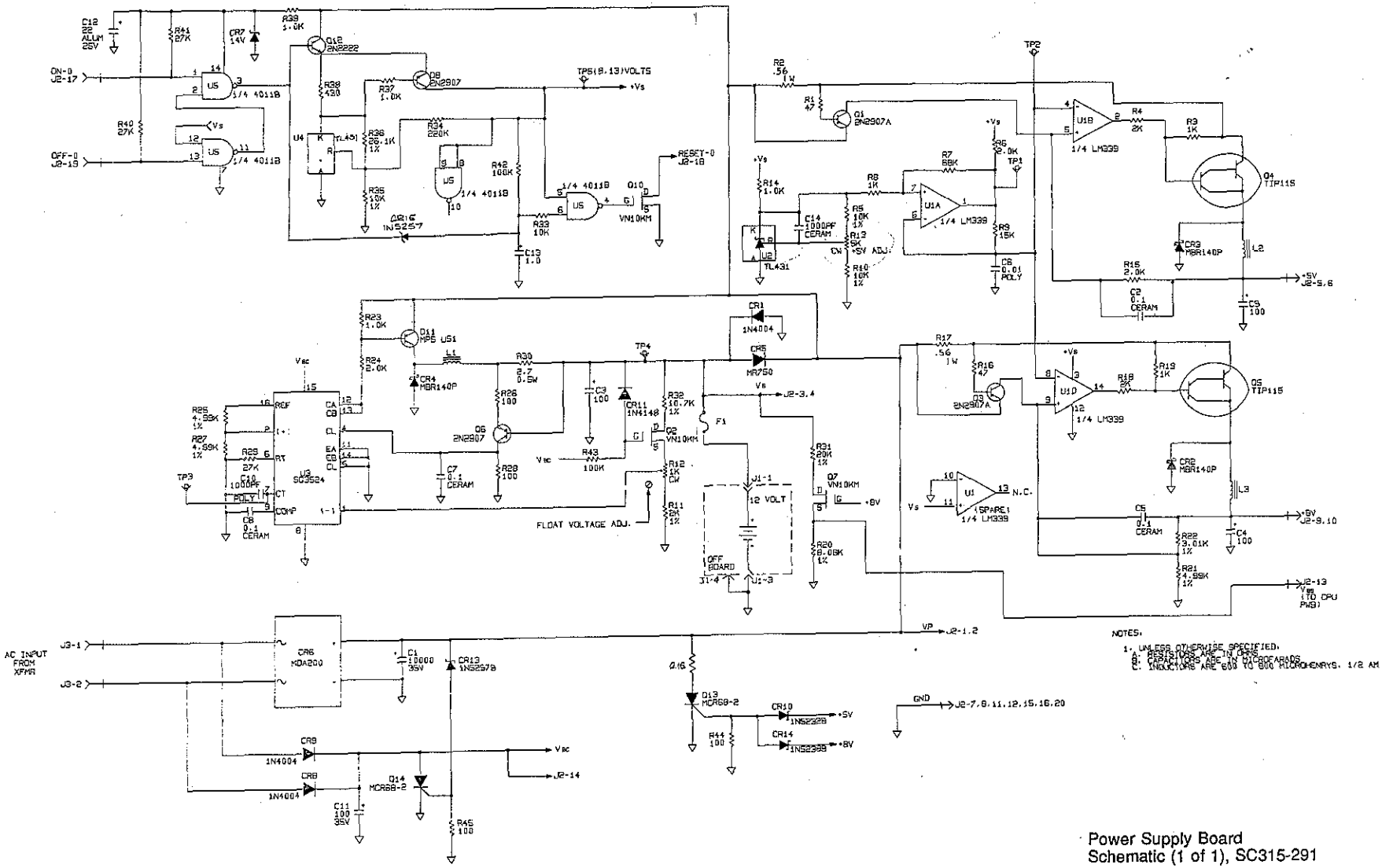
CPU Board
Schematic (1 of 3), SC315-293



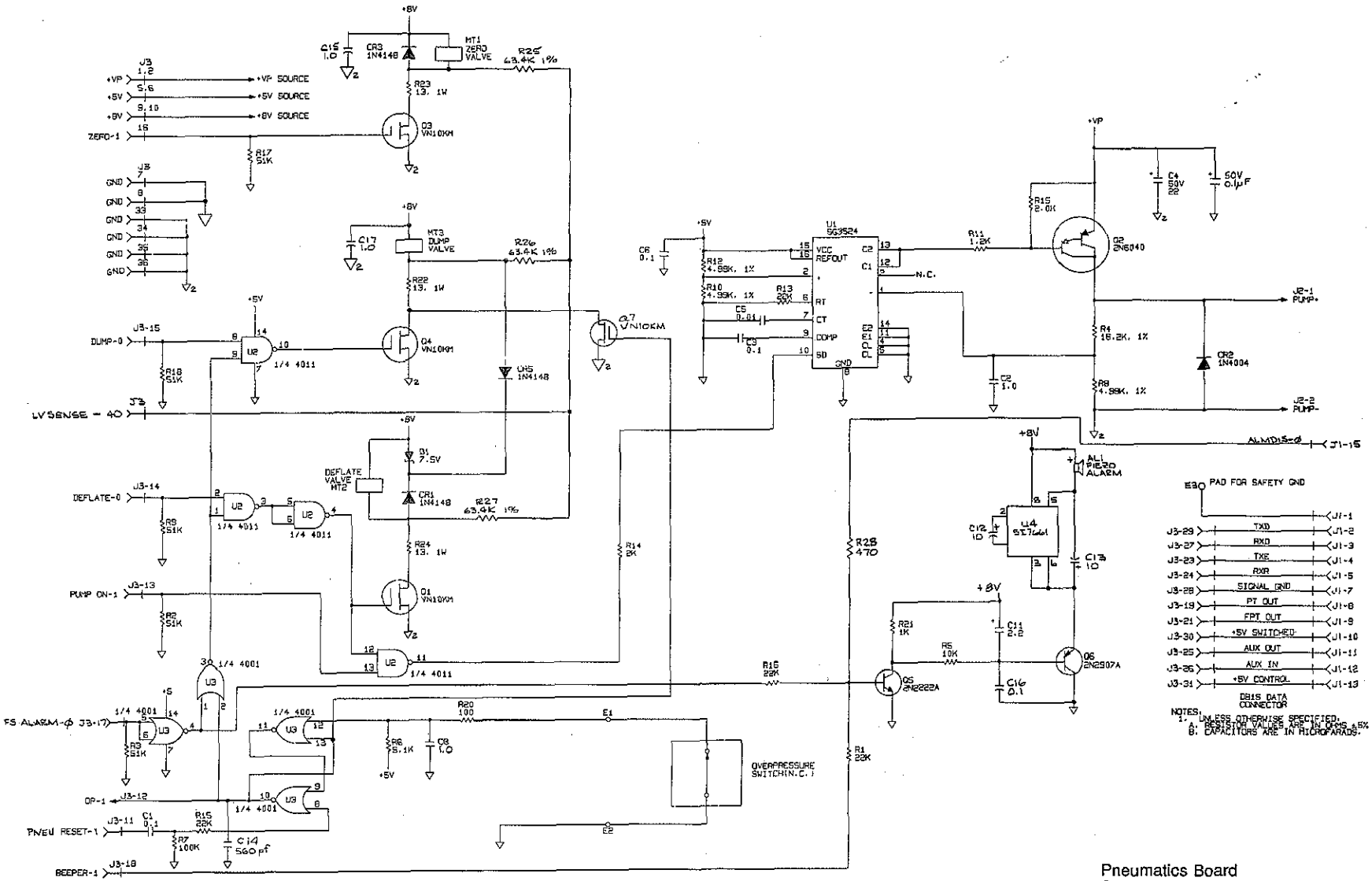
CPU Board
Schematic (2 of 3), SC315-293



CPU Board
Schematic (3 of 3), SC315-293



Power Supply Board
Schematic (1 of 1), SC315-291



Pneumatics Board
Schematic (1 of 1), SC315-292